QRP Quarterly

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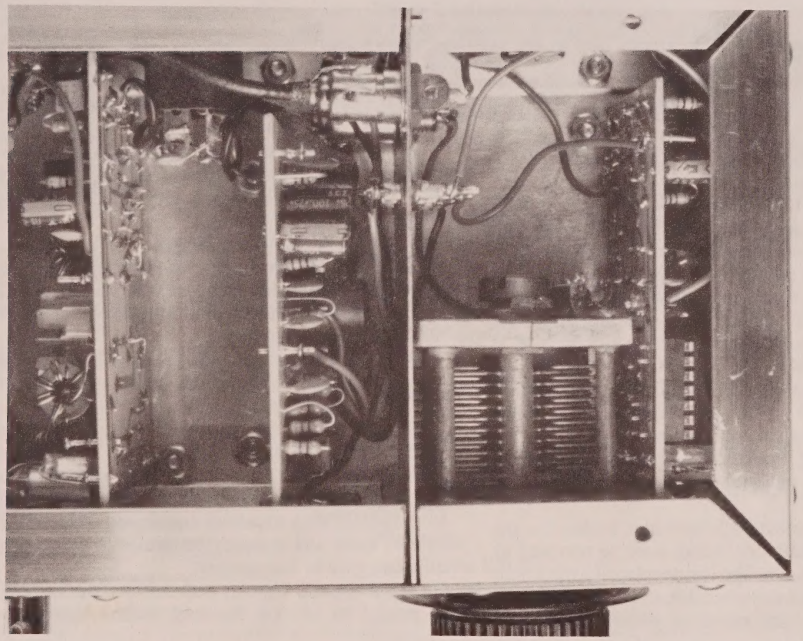

Turn to page 4 to find out how you can put together this QSK Direct Conversion Transceiver for 80 meters.

QRP ARCI NEWS

Board of Directors

Four resumes were received for consideration in filling the four vacancies on the board of directors at the end of the year. Since there is no competition, the current board of directors are reviewing the resumes and will vote on confirming the new appointments by acclamation. The new directors will be announced in the January issue of the Quarterly.

72: Wishing You Good QRP

On July 2, the QRP ARCI Board of Directors approved the adoption of a new signal: "72"—Wishing you good QRP. Gus Taylor G8PG, of the GQRP Club, has received replies internationally from five major QRP organizations approving the use of "72", which was suggested by the U-QRP Club. Other QRP clubs joining in this effort are OK QRP Club, DL AGCW and VK QRPp CW Club. Spread the word!

THE PRESIDENT'S MAILBOX

BY PAULA FRANKE WB9TBU

ARGONAUT 2 PROBLEMS

Recently I had a telephone conversation with Larry Kunk WN9A in Indiana regarding several difficulties he's been having with his new Argonaut 2. I referred him to some local QRPers who are also new Argonaut owners so he could compare notes. Larry has since written, detailing some of the problems:

Everyone I have spoken with about the Argonaut 2 feels that we should coordinate through the ARCI. We need to compile a list of problems and determine how widespread they are. We will then be able to approach Ten Tec as a group and encourage them to resolve the difficulties.

The following problems have been documented:

1. CW note on both sides of zero beat with strong signals.

2. Microprocessor lock-up which makes the rig inoperative. The Lithium battery must be removed to reset the processor. Ten Tec has developed a modification which provides an external reset button.

3. Many birdies, some of which are strong. Some rigs have 10 or more at S5 with an antenna connected. Ten Tec is maintaining the position that the birdies are not a problem with the antenna connected.

4. Keying difficulties; the sidetone will not activate when the rig is used with some keyers, although the transmitter is keyed. The keying line must be pulled to a voltage below the rated low current saturation voltage of moat transistors.

5. The ANTIVOX does not work when the PROC switch is engaged. The rig constantly trips on receiver audio and begins transmitting only to go back to receive as soon as the receiver audio is gone. The problem goes away if headphones are used because the audio does not reach the microphone. Jack Burchfield at Ten Tec stated that this is normal for the Argonaut 2; the VOX was not intended to work with the PROC switch engaged!

6. Frequency instability on CW produces a poor tone which wavers or sounds rough. The keying waveform is clean and pleasant sounding. Chirp is not present. It has been duplicated with the TUNE function on some rigs.

Possibly with a unified approach we can encourage Ten Tec to solve the design problems which plague the Argonaut 2. It is not only to our advantage, but Ten Tec's as well. The Delta 2 is the same rig with a PA module added. The same difficulties will be prevalent with it. Ten Tec seems to be taking the position that the problems exist and 'that's the way it is.' The excellent customer service reputation they have will certainly be tarnished if they continue to respond in that manner.

Everyone I spoke with felt that the rig was over priced by several hundred dollars but those who bought it were willing to pay a premium for a <u>good quality</u> QRP rig. We realize that this is a niche market and the volumes are not high. All would choose to keep the rig rather than accept a refund if the problems can be resolved. Ten Tec has a loyal following among the QRP fraternity; a mutually rewarding relationship is what we all want.

Although the Argonaut 2 has a few problems, it has many significant features which give it a lot of potential. The Argonaut 2 will become an exciting chapter in the continuing Argonaut saga if the problems are resolved.

Continued on page 31

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The QRP ARCI is a non-profit organization dedicated to increasing world-wide enjoyment of QRP operation and experimentation. QRP, as defined by the club, is 5 watts output CW and 10 watts output PEP.

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A QSK Direct Conversion Transceiver for 80 Meters

by Dave Benson, NN1G
80 East Robbins Ave.
Newington, CT 06111

When I set out to build a DC transceiver for 80 meters, I wanted a VFO-based rig with effective audio filtering and thump-free T/R switching without relays. This article describes the result of that effort and highlights the rig's noteworthy features. The project was built on three circuit boards of approximately 1.8" x 3" each and installed in a custom enclosure (see photograph).

Previous articles have stressed the need for temperature-stable VFO components; this one is no exception. Drift is negligible with the Polystyrene caps and -2 toroid material even without resorting to heroic measures. The key to a "no-excuses" signal, however, is in ensuring that the VFO is free from pulling, chirp, and other assorted ills. This rig uses a 1.75 MHz VFO and frequency doubler to provide a clean transmitted signal. This approach is worth the slight extra complexity, as the result sounds good even without shielding around the VFO section. Frequency was adjusted by compressing/stretching turns on the toroid. Transmit offset is provided by VR1, a Zener diode operated below its normal reverse rating to use its substantial capacitance. Any Zener of more than 12V or so should work well. The offset is adjusted to 800 Hz with a select resistor while monitoring the VFO on another rig.

Exterior View of NN1G's 80 meter transceiver

The AF/Control board contains an audio filter, audio amplifier, muting delay circuit, and an 800 Hz sidetone oscillator. Audio filtering is performed with a five-pole Chebyshev low-pass filter with a -3 dB cutoff at 1370 Hz and a -40 dB response at 2940 Hz. The filter can easily be changed to seven poles to further improve the rolloff characteristics. (See recent editions of the ARRL handbook for design tables). While this simple filter is not a "killer QRM-fighter", the effect is easy on the ears during extended operating periods. A bandpass active filter may easily be added between the Receiver and AF/Control boards if desired.

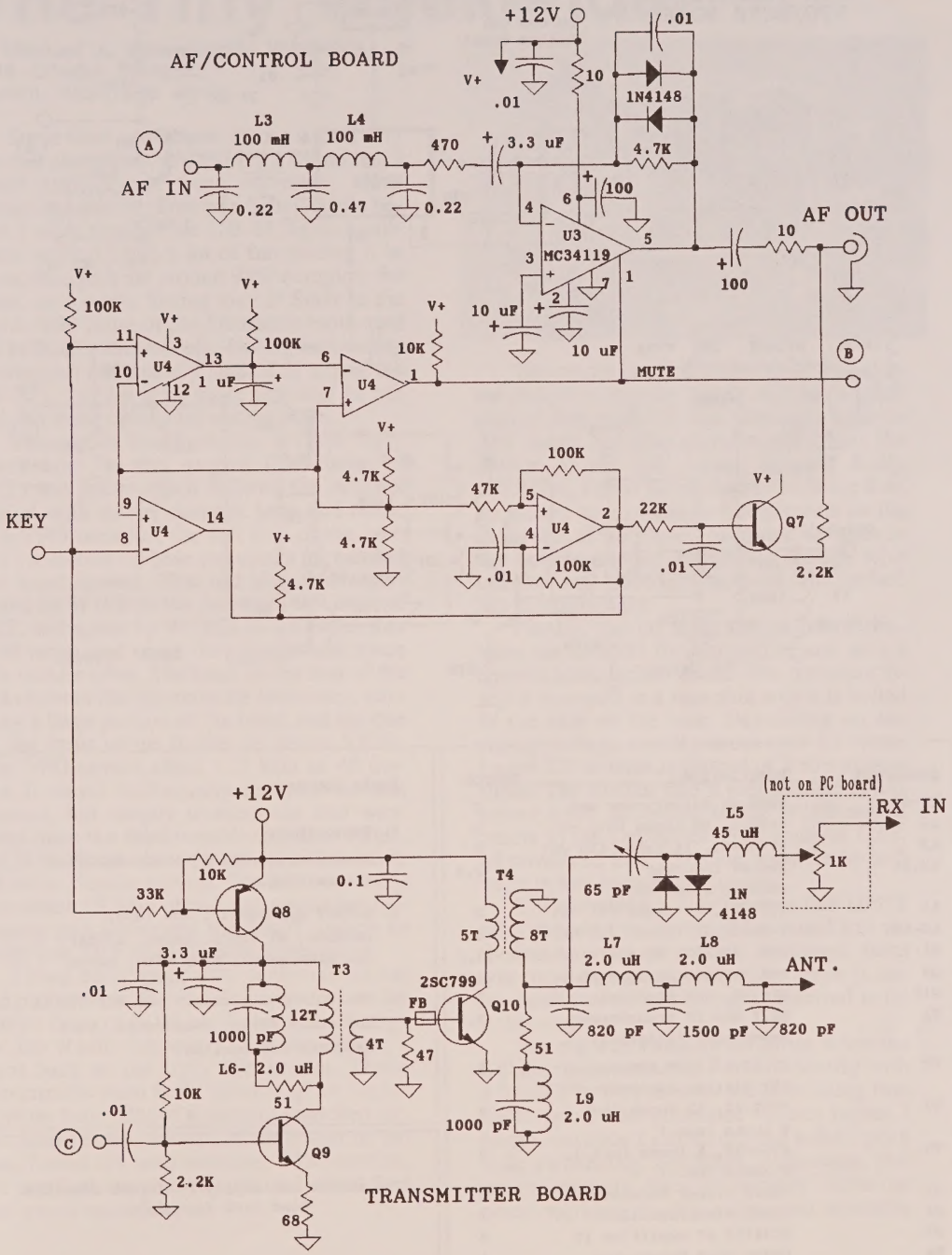
The audio final amplifier is an MC34119, providing a low-impedance output and a muting function. This IC even includes differential outputs to permit direct speaker drive without an output blocking capacitor! The gain of this stage is kept low to minimize switching clicks. The audio output is bypassed at the headphone jack with a .01 µF capacitor to further quiet the keying.

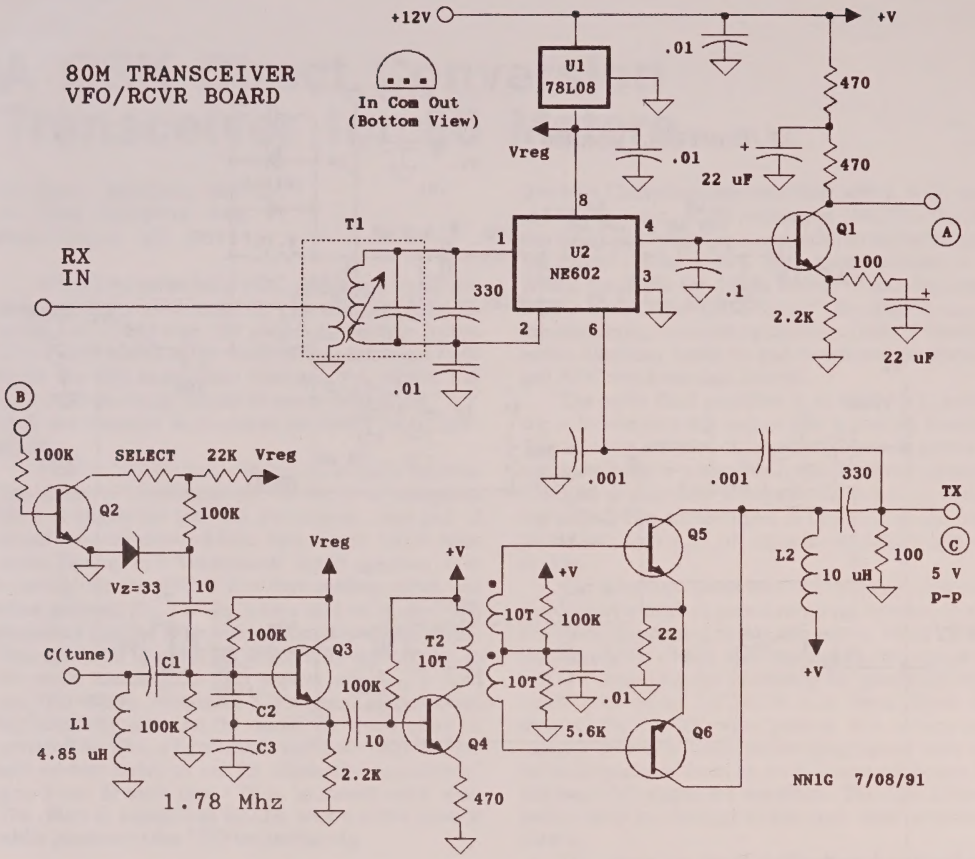
The delay logic provides a key-up delay of about 75 msec, short enough to permit receiving between characters while suppressing thump adequately. While the first version of this circuit used transistors, the use of the LM139 improved the switching by providing clean logic levels to the MC34119 mute input. Spare sections of the LM139 were pressed into service as a sidetone oscillator. Since the resulting square wave signal is fatiguing to listen to, an R-C network before the follower (Q7) shapes the waveform. The 2.2K follower resistor may be changed to suit your taste in sidetone volume.

The transmitter board yields about 4 watts of output power. This value may be adjusted by changing the Q9 emitter resistor. I was able to get up to 7W out but heat sinking was inadequate. The only surprise on this board is in the use of snubber networks for improved stability. (See the Idea Exchange column in the October '90 Quarterly for a discussion.)

I saw cases during checkout where the output contained noticeable amounts of second or even third subharmonic energy without the networks. Since this effect will not be evidenced by TVI, the casual builder may never suspect this problem with access to an oscilloscope. With the networks in place, the output is clean for a wide range of output power and load settings. The readily-available 2N3053 or 2N2219 also work well, yielding about 2 watts with an adjustment to the turns ratio on T3. In either case, a crown-type heat sink is needed.

Does the rig work? My gosh, yes! This rig is my favorite for ragchewing and QRP net check-ins on 80 meters. Field day '90 was an all-homebrew affair here, with this rig netting 90 QSOs in three hours operating time.


AF/CONTROL BOARD
+12V
.01
V+
10
1N4148
L3
100 mH
L4
100 mH
470
3.3 uF
4.7K
A
AF IN
0.22
0.47
0.22
100
AF OUT
U3
MC34119
10
100
100K
10K
10 uF
10 uF
MUTE
B
U4
1 uF
4.7K
47K
22K
Q7
2.2K
KEY
14
.01
(not on PC board)
RX IN
L5
45 uH
1K
33K
Q8
0.1
T4
65 pF
1N
4148
5T
8T
L7
2.0 uH
L8
2.0 uH
ANT.
3.3 uF
T3
2SC799
FB
Q10
12T
1000 pF
4T
47
51
820 pF
1500 pF
820 pF
L6- 2.0 uH
L9
2.0 uH
1000 pF
C
Q9
68
TRANSMITTER BOARD



Component	Description	Source
C1-C3	5000 pF Polystyrene cap	2
L1	T-37-2, 35 turns (4.8 uH)	3
L2	FT-37-61, 14 turns (10 uH)	3
L3,L4	100 mH Inductor (Mouser #43LJ410)	2,4
L5	FT37-61, 28 turns (45 uH)	3
L6-L9	T-50-2, 20 turns (2.0 uH)	3
Q1-7, Q9	NPN, 2N2222A or equivalent	1,3
Q8	PNP, 2N3906 or equivalent	1,3
Q10	2SC799, NPN RF Final	3
T1	10.7 Mhz IF transformer, green core (#42IF123)	3,2
T2	FT-37-43, 10T (Primary), 10T Bifilar (Secondary)	3
T3	FT37-43, 12 turns (pri.), 4 turns (sec.)	3
T4	FT50-43, 5 turns (pri.), 8 turns (sec.)	3
U1	78L08 Linear Regulator IC	3
U2	NE602 Mixer/Oscillator IC	3
U3	MC34119 AF Amplifier IC	4
U4	LM339 Quad Comparator	1
VR1	33V Zener, non-critical	3

Parts Sources:

1. Radio Shack
2. Mouser Electronics, 1-800-992-9943 for catalog.
3. KA7QJY Components, Box 7970, Jackson, WY 83001. Danny, KA7QJY, can also supply many misc. parts
4. The author can supply the MC34119 IC and audio filter components. Send SASE for information.

The author can supply PC layout drawings. Send SASE for copy.

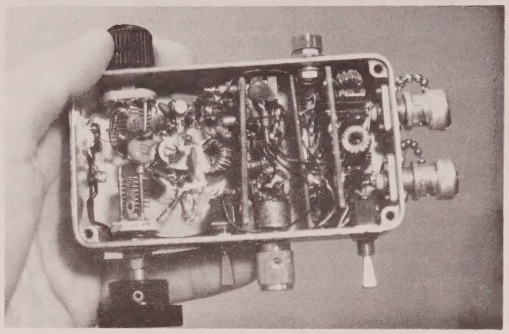
The Tiny Weekender

by Michael A. Czuhajewski WA8MCQ
7945 Citadel Drive
Severn, Maryland 21144

Some time ago I came across a nice, tiny die-cast aluminum box and bet a friend that I could stuff a one watt, 40 meter VFO transmitter into it. (This was quite a while before I went through the DB-25 rig-in-a-pill-bottle craze.) I had a lot of fun putting it in there, though it sat around 98% complete for about six months. Seeing the Lil' Sucre in the April 1989 issue of the Quarterly motivated me to finally finish it off. The rig isn't nearly as compact and densely packed as any of the DB-25's, but it's a lot more practical to use and can stand up to a lot more abuse.

This rig is based on the W7ZOI Ugly Weekender, in the August 1981 issue of QST, and pretty much follows the original design with minor changes here and there. The VFO occupies the left half of the box, and I used two variable capacitors for bandset and band spread. That old idea was resurrected by W1FB in the January 1989 issue of QST, and again by W7ZOI in the December 1989 issue, and saves the expense and space of a vernier drive. The knob on the rear of the box chooses the approximate frequency, covering a large portion of the band, and the one on the front varies it plus or minus 5 kHz. The VFO covers about 115 kHz of 40 meters. It wasn't deliberately designed for that amount, but simply worked out that way. Since there is a third variable capacitor inside, the 115 kHz window can be moved to cover the entire Novice portion. The VFO normally sits about 15 kHz above the operating frequency and activating the SPOT switch or going into TRANSMIT shifts it into place.

I tried the original VFO buffer circuit but had problems with it and finally settled on the design from page 99 of "Solid State Design for the Radio Amateur." For the driver, I went back to the Ugly Weekender. Those two circuits were built "dead-bug" or "ugly" style on both sides of a piece of unetched circuit board stock, the one in the center of the box. I used 1/4 watt resistors, FT37 toroids, the smallest ceramic capacitors I could find and lots of monolithics.



The center board contains only a transistor switch to key the driver, and has a great deal of free space. It was originally built on perf board, but after corresponding with the author of the Lil' Sucre, Donald Kelly KA5UOS, I tried his method of building it on an etched board with the components on the same side as the etched pads, and no holes in the board—surface mounting, though with conventional leaded components. The method has its advantages.

Finally, the far right circuit board contains the 2N3553 final amplifier and uses a conventional etched board. The transistor itself is mounted in a heat sink which is bolted to the side of the box. Depending on the supply voltage, it will put out over 1.5 watts. I used T37-6 toroids instead of T50's to save space. The smaller size is still suitable at this power level; according to the W1FB toroid article in the December 1988 issue of QST, all powdered iron T37's are good for up to 5 watts in low impedance circuits.

T/R switching is handled by a DIP DPDT relay mounted on the amplifier board and activated by a toggle switch. Although there was more than enough room for break-in delay or electronic switching, I preferred to do it this way.

The rig was virtually complete when the Lil' Sucre appeared, so I could identify with a lot of Don's comments about building tiny QRP rigs. I had grandiose visions before I began, but once I started drilling holes I got a rude awakening. Switches, connectors and potentiometers became terribly intrusive when working on this scale, and consume

quite a few precious cubic centimeters. Circuit board must be designed with free spaces to provide clearance for chassis mounted components, eating into your design space. As both KA5UOS and W7EL said, maintenance and modification on tiny QRP rigs is somewhere between difficult and impossible. Still, building something this small was a very enjoyable experience (and more practical than the DB-25 rigs).

How was the project received? Every non-QRPer I've shown it to has been impressed. However, I made the mistake of showing it to some prominent QRPers around the country and their reaction was often one of boredom—"oh, it's only a transmitter?" As always, a prophet is without honor in his own country! At least W7ZOI got a kick out of the pictures. In a way, W7EL set a bad precedent with his microscopic Optimized QRP Transceiver (QST for August 1980). It's the same principle as the one at work when someone makes a tape of a local band in their garage and then asks Mick Jagger to listen to it. Moral—if you have a homebrew project that you're proud of, choose your audience carefully!

What to name the rig? Due to its roots, it had to be called the Tiny Weekender, though that's a bit misleading since it took quite a bot longer than a single weekend to do the planning and construction. I'm still going through a phase of building tiny rigs even now. I agree with KA5UOS when he says they aren't always exceptionally practical (and I include the entire DB-25 series in that), but they still make interesting and fun projects, and the best part is that they often stimulate others to try homebrewing.

QRP ARCI AWARDS SUMMARY

Call	Date	Basic	Notes	MI/W	PWR	Mode	Band
			DXCC				
SM5OCK	4/7/91	108C			5.0	CW	MIX
K3CHP	5/19/91	109C			5.0	MIX	MIX
NØJR	5/19/91	105C	250 ENDORSEMENT		5.0	MIX	MIX
			QRP-25				
N3PM	5/19/91	660	700 ENDORSEMENT			CW	
			1000 MILE/WATT				
SM5OCK	4/7/91	1231	TO VK2DZD	3245	3.0	CW#894	21#389
WU2J	4/7/91	1232	TO 5Z4BI	8207	0.9	SSB#255	21#390
N8KCG	4/7/91	1233	TO ZD9BV	1842	4.0	SSB#256	21#391
W3FAF	4/22/91	1234	TO JA2AJA	1351	5.0	CW#895	28#167
W3FAF	4/22/91	1235	TO VP8ANT	1472	5.0	CW#896	10.1#8
W3FAF	4/22/91	1236	TO G4BLX	6908	0.5	CW#897	7.0#182
W3FAF	4/22/91	1237	TO VK4AIX	1910	5.0	CW#898	28#168
W3FAF	4/22/91	1238	TO 3B8CF	1864	5.0	CW#899	14#325
PE1LIF	4/22/91	1239	TO VK6PA	2198	4.0	SSB#257	50#50
VE3DB	5/19/91	1240	TO KJ4GK	8590	0.1	CW#900	1.8#9
5Z4FM	5/19/91	1241	TO N8DHT (2X QRP)	1541	5.0	SSB#258	28#169
N8DHT	5/19/91	1242	TO 5Z4FM (2X QRP)	1541	5.0	SSB#259	28#170
K7JBQ	5/19/91	1243	TO CX3EU (2X QRP)	1106	5.0	CW#901	28#171
GØFTO	5/19/91	1244	TO JF7UNG	1909	3.0	CW#902	21#392
VE5DC	5/19/91	1245	TO GM3KPD (2XQRP)	3787	1.0	CW#903	28#172

THE DX HUNTER

by Jim Griffin, W9NJP
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St. Charles, IL 60174

Finding the rare one has always been the dream of every hunter. In fact it can become an obsession. Ordinary hunting almost loses its challenge when one reaches this stage. Some hunters go to great extremes, sometimes maybe too far in their quest, to fulfill their dreams.

And so it was with the Deerus Xarias, or DX as we called it. Like any other biological species, some breeds were more common than others. Some were very rare. To bag a rare one was a dream of mine. Of course it was a dream of many other DX hunters.

One day, while tracking down what I thought was one of the rare ones, I ran into another DX hunter. This fellow was quite young, and I was somewhat taken aback by all the gear he had. My initial impression of him indicated more of a military man than a hunter. I wondered why he had all that equipment.

"Looks like you're ready for World War III," I quipped.

"Well, old timer," he replied, "times have changed since your day. We DX hunters are now state-of-the-art. We use modern technology to find and bag our DX prey."

"I don't understand," I retorted. "Sure, maybe the weapons have been designed and made better, but the nature of the hunt hasn't changed any."

"Old man," he came back, "people like you would have us still living in caves." He chuckled, finding himself funny. "Hunting is now a science. Let me show you some of this gear and demonstrate how a modern hunter functions."

Out first came a computer. He showed me how it was programmed to aid in tracking down the DX. It listed various times and locations where the DX could be found, both common and rare ones. "This machine saves me lots of time," he inserted. obviously he was an important person whose time was very valuable.

Next was the radio. He informed me that when other DX hunters found their prey, they would get on the radio and inform all other DX hunters where to find them. On a good day they would find a rare one; all would conglomerate at the scene. They then would all stand there and shoot at this poor Deerus Xarias, seeing how many of them could hit the poor creature. "Strange," I thought to myself.

Then he showed me his weapon, something that could be described more as a cannon than a rifle. I questioned his use of a weapon that was bent more on destruction than anything else. "You want to make sure you don't miss, and this baby packs a real punch. Since other modern hunters use these, I have to in order to compete. But still I like it because it really blows them away." His information left me aghast.

He then explained other modern techniques of hunting DX. They hire helicopter pilots to route the DX to rare locations. In this way they can claim they found them in exotic locations. "Makes for a nice vacation," he said.

Finally he related how important it was to cut off the tip of the horns and mail them to some organization to prove he bagged the DX. After sending in so many horns, he would get a big certificate to hang on his wall so that other DX hunters could admire it. He had to go to a lot of trouble and expense to get the endorsements, since each breed of Deerus Xarias counted only once.

Having been a hunter all my life, and taking great pride in my abilities along with my sportsmanship, something snapped inside of me. This guy was sick!!!

We use modern technology to find and bag our DX prey... Let me show you some of this gear and demonstrate how a modern hunter functions.

I explained to him that DX hunting was supposed to be a challenge and a sport, man against the elements. I told him in no uncertain terms that anyone could do what he was doing; it was more a matter of money than anything else. How could he call himself a hunter - he was an appliance operator. "You don't track the DX yourself, you blow it away with your cannon, and you are more concerned with bragging rights than with the knowledge of professionalism. How can you call yourself a DX hunter? You don't hunt. You don't have any skill. You look for only the easy way. Anyone can do what you are doing!" I was fuming.

"Get with it pops," he exclaimed as he hauled all his equipment away, listening to a report on his radio about a herd of DX in the area.

I yelled to him one last time. "If you were really good, you would do as I do and hunt in the desert for DX with only a knife."

He suddenly turned around and asked, "The Deerus Xarias never go to the desert; they can't stand the heat. Additionally, my poor demented man, you could never bag DX with a knife."

"I know all that," I replied smiling, "but I love the challenge!"

Modifying the MFJ-422B Keyer

by Marc Ressler, K3NCO

Everyone seems to be interested in building keyers into their latest portable rig. While the idea is to eliminate all those extra boxes you seem to need on a QRP vacation, it is also a little out of hand to have a keyer in every one of your rigs when you have more than one.

I have always thought the MFJ-422B keyer was the right idea, being barely larger than the Bencher paddle it sits on. As delivered, it does about 5-50 wpm and has a built-in sidetone monitor with volume control. It is also capable of running off its internal 9 volt battery, thus eliminating another set of wires and those darn little wall plug transformers.

But there's one problem: it pulls about 15 mA in idle, about 20 mA more key down, and over 100 mA with the volume turned up! At this rte, the battery won't make it through a weekend if you have the keyer turned on. No wonder they have an LED pilot light to remind you it's turned on (the power switch being of the push-on push-off type, and facing away from the operator). Wait a minute—half that power drain turns out to be caused by the LED!

It turns out that reducing the LED current is not the solution, although I started off that way. The other source of idle current drain is the diode and the LED from the circuit reduces the current drain below a level I can reasonably measure (microamps). A quick calculation shows that forgetting to turn the keyer off for 6 MONTHS will use less current than when it is on for one hour with the original circuitry that tells you it's on!

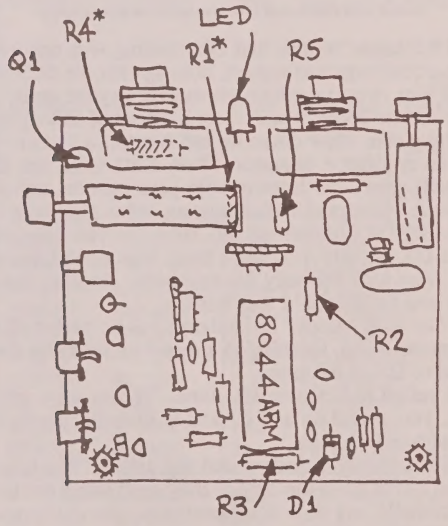


Fig. 1 *-see text

Remove the cable clamp crew on the bottom of the Bencher and the centered rubber foot, then slide the keyer chassis off the paddle. You can actually get away with just cutting the leads to the LED and the zener diode without having to take the circuit board out of the chassis (see figure 1). However there are some other changes which will make the keyer function better with these changes. Besides, I wanted to leave the LED there to fill the hole in the panel. From the top, remove the two larger screws in the corners. This will release the side panel containing the speaker. Turn the keyer over, slide the speaker wires out.

Remove the two nuts with the captive lock washers from the rear of the PC board with a nut driver (the mating screws for these are the two smaller Phillips screws on the top, but they also hold the threaded standoff in place). Remove the 9 volt battery and disconnect it. Remove the volume and speed control knobs and the hex nuts and washers holding them to the inside of the chassis. Lift the rear of the PC board off the screws and tilt the board up while pulling the pots out of their holes. This is so you will clear the battery clip, which may have to be squeezed a little to get the board free.

The LED dropping resistor, R1, is best removed by clipping both of its leads with a small pair of cutters, as it is installed underneath the Semi-Auto Switch. Remove D1 and replace R3 (470Ω) with a low value (I used 43Ω) resistor. This will eliminate the chirping that occurs at low battery voltages while providing, in conjunction with C1, RFI filtering when you use an external supply (see Figure 2). For improved volume control range, now that the chip is running off the full battery voltage, replace R4 (47kΩ) with 330kΩ. You will need to carefully bend the pot forward, as R4 is installed under it.

I also wasn't thrilled with the range of the speed control—too slow at one end and cramped together at the other. I replaced R2 (27kΩ) with 43kΩ to reduce the maximum speed and paralleled a 200kΩ resistor with the speed pot on the bottom of the board to increase the minimum speed. This produces a new speed range of 11 to 40 wpm.

With the volume control on the keyer turned all the way down, the key down current was measured as 19 mA and the key up current was negligible. Assuming a 50% duty cycle while you're sending and a 50% transmit/receive duty cycle (contest or looonnnggg rag chew situations) you should get about 120 hours of actual operating out of an alkaline battery. That's quite a few weekends, or evenings while on vacation. To save the internal battery for just those travel stints (it's such a pain to change) I added an outboard 6 volt battery pack (4.5 volts will work as well). This consists of four AA cells in a Radio Shack (#270-391) holder soldered to a 2.5 mm mini-plug. The red (+) wire goes to the tip of the connector (Radio Shack #274-290) and the black to the sleeve. With this type of connector you are shorting

out the batteries part of the time when you plug or unplug it. So don't dawdle; or just leave one of the batteries out of the holder to open the circuit.

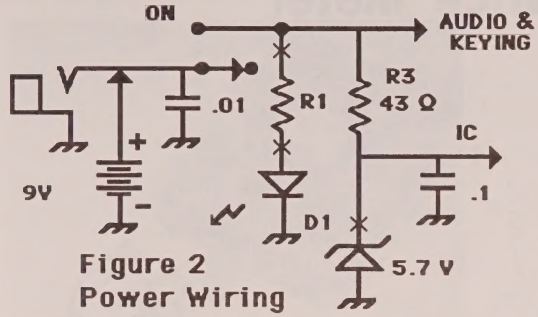


Figure 2
Power Wiring

The whole affair is held on the top left of the keyer with a piece of Velcro. The wires that come with the holder are just the right length to reach to socket. At 4.5 volts, the measured current drain is a half of what it is at 9 volts. AA batteries have twice the amp-hour rating of the 9 volt pack. If you are a real weight and volume freak, you just zip it off and leave it at home and run on the internal battery. But if you are a weight freak, you don't want a Bencher. That steel base weighs a ton (which is why I like it—it doesn't walk around the table).

Now, if your rig already has a sidetone of its own, you're done—but I just hated pulling 40 mA to get reasonable audio, and 90 mA when I turned it all the way up. I tried one of these piezo speakers they make for computers, but it pulled as much current and made less audio. I also had a 100 Ω hamfest speaker that made lots of audio with a max drain of 40 mA. But it was too big to fit inside the keyer. If you've got a small 100 Ω or 200 Ω speaker that will fit, it should work well. Another hamfest goody that was small enough but had less output, but with less drain, was an old magnetic microphone element.

All of these approaches are more efficient if you change the output stage to a common emitter configuration and put the "speaker" in the collector circuit in place of the 20 Ω resistor there (figure 3). To do this, cut the PC trace leading from the emitter of Q1 to the pink speaker lead. Remove the 30Ω resistor and solder a jumper from the speaker lead trace to the collector side of the resistor. Solder a short jumper wire from the emitter of Q1 to the ground trace at the edge of the board. Remove the black speaker wire from the ground connection near the cable tie and put it in the + hole that the zener diode used to occupy.

The disadvantage of this configuration is that there is a very small range of the volume pot between quiet and max output. This is because Q1 is not biased on (to save current) and it has a lot of gain, while being driven with a square wave that easily runs it into the stops. Adding a small (1500 pF) capacitor from the base to ground will extend this range some while "softening" the tone. The most efficient thing I found, and one that works well in the original circuit configuration, is a piezo transducer. The one I used was a Radio Shack #273-073. These are high resistance devices that require a lower driving impedance, so you need to parallel them with a resistor.

Basically I found that as I lowered the resistor in parallel with the transducer that the audio increased (at least until 100 Ω). However, the current consumption also goes up. The best trade-off was at about 1000 Ω where, at resonance, the key down current was 22 mA, only 4 mA more than with no transducer. It is a very high Q device with a resonance over 2 kHz, and that's the only place you can get it to make much audio.

If you have a very high pitched sidetone, forget these things. This also means you have to carefully set the sidetone frequency pot to maximize the output. This is best done while the chassis if off the paddles as reaching through that tiny hole and trying to slowly turn that PC pot with a jeweler's screwdriver is really frustrating. The original speaker is just glued in—you can carefully peel it free and save it for your next project. Drill a hole in the center of the grill area large enough to match the one in the piezo transducer and then glue it in place (contact cement seems to work fine here).

Now enjoy, knowing how many more hours you'll be able to run before replacing a battery.

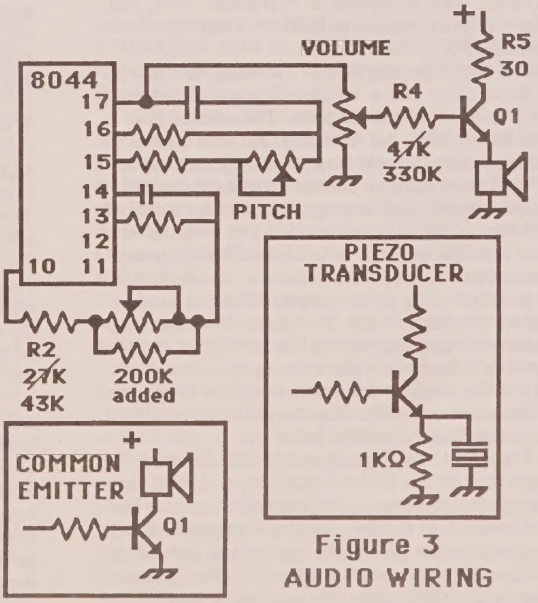


Figure 3
AUDIO WIRING

A Simple Capacitance Meter

by Michael A. Czuhajewski WA8MCQ
7945 Citadel Drive
Severn, Maryland 21144

A capacitance meter is a very handy thing to have in the QRP workshop, but I could never bring myself to spend over $100 for one of those handheld digital L-C meters. I couldn't really justify it based on the relatively small amount of use it would receive. True, they also measure inductance down to 1 µh, but the resolution is only 1 µh, which isn't good enough when most of the coils you wind are under 10. Some digital voltmeters have a capacitance range, but I already have a fluke 77 and couldn't see buying another DVM just to get the picofarads.

Obviously, the answer was to roll my own. The maxim about getting the most satisfaction from something you build yourself doesn't just apply to transmitters and receivers. But which way to go—analog or digital? Those adapters to let me read capacitance on my counter didn't appeal to me, but there's nothing wrong with an analog cap meter, and we don't always need digital resolution in homebrewing.

There have been several such meters published over the years, and the one which appealed to me the most was covered in three issues of Ham Radio. The original article was in April 1975 by Courtney Hall WA5SNZ, with his update in November 1978, and further improvements in March 1980 by Tom Varmecky WA3CPH.

The device is quite simple, consisting of a pair of 555 timer chips and a 10 µa or 1 ma meter, along with a few miscellaneous parts. The articles give a better description, but basically the first 555 is a pulse generator at a fixed frequency, triggering another 555 which is wired as a one-shot multivibrator. (The original circuit used a programmable unijunction transistor for the pulse generator.) The width of the pulses from the one-shot is determined by the size of the unknown capacitor, and a meter is used to read it. The average value of the output current is proportional to the pulse width. The bigger the capacitor, the wider the output pulse and thus the higher the average value. Best of all, the meter scale is linear. It's read just like a voltmeter—select the proper range and read the unknown value. The only difference is that you get picofarads instead of volts.

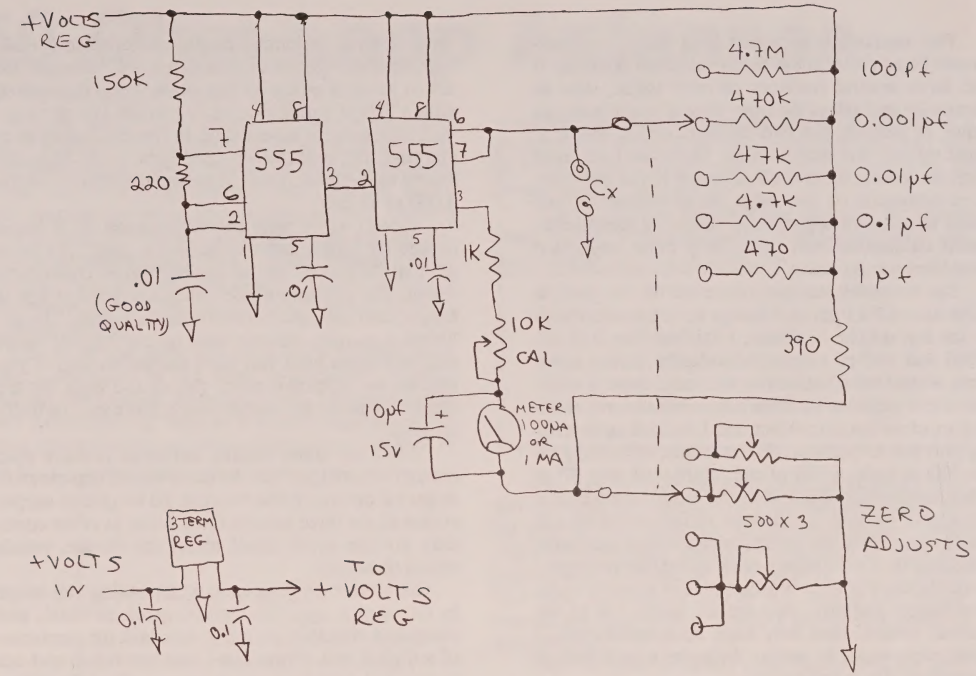
You should use a good quality unit for the 0.01 µf capacitor on pin 2 of the first 555, since that sets the triggering frequency, and it should be stable. The precise value isn't critical, though, so you can use the first good quality 0.01 you come across, instead of carefully choosing one from a handful. The resistors on the range switch should be as close as possible to the nominal values—more on that later.

WA8MCQ's Simple Capacitance Meter

Referring to the picture, the pair of binding posts on the left is for a nominal 12 to 15 VDC power input. I prefer to use my bench supply for everything and hook it up to different devices as the need arises, rather than go to the trouble and expense of putting a supply in everything. You could have a built-in power supply if you wish, with either internal power transformer or a plug-in wall transformer. Due to the current drain of the unit plus the need for a constant voltage for stability and repeatability, batteries are generally not a good idea. The exception is portable use, such as taking it to a hamfest, where you may need to test capacitors on the run out in the parking lots and fields.

The actual voltage feeding the chips isn't critical. WA5SNZ first used a 12 volt zener, and later 6.2 volts, while WA3CPH used a 7805 three-terminal regulator. You could also use one for 6, 8 or 9 volts; I used a 78L09 myself, since I had several on hand. The 78LXX series is similar to the 78XX family, but smaller, and look like a 2N3904 plastic transistor. They are rated at 100 ma, which is plenty for this circuit, while the 78XX family will handle 1 amp. Use whatever family and voltage you have or can obtain the easiest. As always with three-terminal regulators, be sure to put bypass capacitors with short leads on the input and output terminals.

The binding posts on the right are for the unknown capacitor. Below them is the range switch, with full scale readings of 1, 0.1, 0.01 and 0.001 µf (1,000 pf) and 100 pf. (WA3CPH added a 50 pf range.) The two knobs to the left of that are for the coarse and fine calibration pots. Only one is really needed, but I added the second, smaller pot (not shown in the schematic) in series as a vernier to make adjustment less touchy. To the left of those are three trimpots which are set once during initial calibration, for zeroing.



I used a 100 microamp meter because it fit the hole in my old chassis. You could also use 1 ma or anything in between. You set the CAL pot for full scale during calibrations, so just about any meter can be used as long as the circuit is capable of driving it to full scale. The important thing is that the meter have a linear scale—no logarithmic scales allowed! Although not mandatory, it's nice if the scale is 0-1 or 0-10, etc., so you can have ranges which are multiples of 10. However, there's nothing wrong with having ranges which are a multiple of 2.5, 5, etc., so use whatever meter is available.

Below the cap meter are some optional homemade test adapters to supplement the binding posts. I used insulated alligator clips, test lead wire and banana plugs for the clip leads; these are useful for connecting leadless capacitors, such as variables. the other adapters are alligator clips soldered directly onto banana plugs, and covered with heat shrink tubing. These are plugged into the binding posts to hold capacitor leads, which makes testing much quicker when you have a lot of caps to check.

Don't forget that using adapters adds some capacitance which must be compensated for when making measurements.

Calibration is simple. First, with power disconnected, set the meter needle to zero with the mechanical adjustment screw. Next, apply power but leave the UNKNOWN jacks empty. Balance out the effect of residual capacitance in the circuit and wiring by setting the three zero-adjust pots.

Go to the 100 pf range and adjust that pot for zero on the meter. Repeat with the 1,000 pf and 0.01 μf range pots. that last one covers all higher ranges as well, since the few picofarads floating around inside the box are a very small percentage of full scale up there and have negligible effect. WA5SNZ used 500 Ω pots, while WA3CPH found those difficult to et and used 50 Ω. use whatever you find works best. They can be PCB-type miniature pots if you have them, because they normally will be used very rarely, and need not be mounted on the outside as mine are.

After zeroing, you're ready for the actual calibration. The WA3CPH method is to connect a 0.001 μf (1,000 pf) cap of 5% or better tolerance, set the meter to the 0.001 μf range and set the calibration pot for full scale. WA5SNZ used a 100 pf capacitor and range. If your meter scale has 250 or 500 at the top, you'd use caps of 250 or 500 pf for calibration and relabel the ranges in multiples of 2.5 or 5 instead of 10. Another possibility, depending on what values you have, would be to use a 220 or 240 pf cap to set the 250 range, or have 470 pf for 500, setting the needle to the appropriate mark just below full scale.

For maximum accuracy, the range resistors should be as close to the listed values as possible. If you have several resistors of each value, take an ohmmeter and select the ones closest to the nominal value, or perhaps put two smaller ones in series to come up with the proper value. The more care taken here, the greater the overall accuracy if you only perform calibration on one range. As an alternative, you could use pots of appropriate values. It complicates initial calibration, but that's only done once, and would increase accuracy.

I'm normally not too interested in the precise value above 0.01 µf, so I accept the calibration as is on the top ranges. However, I calibrate the 0.01 µf, 1,000 and 100 pf ranges individually before using them when I need maximum accuracy. there is some noticeable variation between ranges because my resistors are close but not perfect, and I decided against using pots due to laziness. (For example, calibrating on the 100 pf scale, a 100 pf cap might read only 80 pf when switching to the next higher range.) I have mica capacitors of 100, 1,000 and 10,000 pf (0.01 µf) which I keep with the meter for calibration standards. I checked their precise values on two different capacitance checkers of known accuracy, and keep the numbers handy. Happily, they are all within 1% of the marked values. Had they been substantially off, I could compensate by setting the meter a bit higher or lower than 100 as appropriate.

A few warnings and idiosyncrasies about the circuit—first, don't short the test leads together, since this will cause the meter to peg. Also, don't touch the hot lead while taking a reading since this will make it read higher.

There is another fluke to watch out for, pointed out by WA5SNZ—if the capacitor is too large for the range setting, the circuit might give erroneous readings; it could read less than full scale, although the actual value is well over full scale. I saw this myself with a 220 pf variable capacitor on the 100 pf range. As I increased the capacitance, the needle moved up to and past 100, suddenly dropped back to 60, then continued to increase again. (It behaved normally on the 1,000 pf range.)

I don't agree with his explanation of it being caused by "going outside the linear area". It's more akin to "aliasing" in the analog/digital conversion world. The problem comes when the pulse width is longer than the time between trigger pulses. The solution is simple—always start on the highest range and step down until you get a usable reading. If you slap on an unknown value that is too high for the range, and never try another range, you could be badly spoofed.

I left out some details, but there is more than enough information for the experienced homebrewer to get the circuit up and running. I'd be glad to supply copies of the three articles for a dollar to cover costs; they go into more detail about the device, which would be helpful.

Don't turn up your nose at an analog cap meter in this digital age. It's simple, quick to build, and cheap and effective, even if it does lack the resolution of a digital unit. (Note that I said resolution and not accuracy; I think by now everyone realizes the difference between the two, and that "digital" doesn't necessarily mean "more accurate".) What's more, analog has a "homey" feel lacking in digital. As WA3CPH pointed out, it's fun to put a variable cap on it, swing it back and forth and watch the meter follow suit. You just might find it addicting!

Bibliography:

"Direct-Reading Capacitance Meter" by Courtney Hall WA5SNZ, Ham Radio, April 1975, page 32

"Simplified Capacitance Meter" by Courtney Hall WA5SNZ, Ham Radio, November 1978, page 78

"Improvements to the Simplified Capacitance Meter" by Tom Varmecky WA3CPH, Ham Radio, March 1980, page 54

Problems, Questions, Comments?
Who To Contact—

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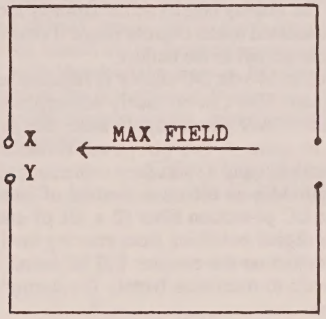
- **Technical articles:** Mike Czuhajewski WA8MCQ, 7945 Citadel Drive, Severn, Maryland 21144
- **QRP Contests:** Red Reynolds, K5VOL; 835 Surryse Road; Lake Zurich, Illinois 60047
- **Nets:** Danny Gingell, K3TKS; 3052 Fairland Road; Silver Spring, Maryland 20904
- **Awards:** Bob Gaye, K2LGJ; 25 Hampton Parkway; Buffalo, New York 14217
- **Club Operations:** Paula Franke, WB9TBU; P.O. Box 873; Beecher, Illinois 60401; 708-946-2198
- **Club Information packets** (include $2): Mike Bryce, WB8VGE; 2225 Mayflower, N.W.; Massilon, Ohio 44647

50 Ohm Loop Antennas

by Brice Anderson, W9PNE

For the first 50 years of my ham operations, I used single- or balanced line feed for my wire antennas, with home-built antenna tuners. Several years ago, I changed to coax feed with multi-position coax switches, which made antenna switching very simple and fast. Now, I like loop antennas since they often provide a better signal-to-noise ratio on receive than wire antennas, and are compact. There are two loop configurations that offer a close match to 50 ohm coax without any balun, stub, or Gamma match.

One such loop is the vertical half-wave square loop, which I described in the April 1986 QRP Quarterly (from the 1949 ARRL Antenna Book). This antenna radiates practically as well as a dipole mounted much higher above ground, and its configuration is shown in Fig. 1.



EACH SIDE = 1/8 λ

FIG. 1

I was looking through some old magazines, when I saw an article written by James L. Lawson, W2PV (September, 1980 *ham radio*) on full-wave rectangular loops. Using a computer, Lawson calculated the dBi gain and feedpoint resistances for these antennas as their dimensions were varied.

His charts showed the feed-point resistances for loops varying from a folded dipole (very flat loop), through a square, to a very tall and narrow loop. The folded dipole had an input resistance of 292.5 ohms, the square had 120.5 ohms, and the tall loop had 3.77 ohms. Interpolating his data, a loop with a height twice its width should have a 50 ohm feed-point resistance.

Anxious to check this out, I built a 28 MHz loop using a 15 foot 2x2 mast with two cross arms. For 28.3 MHz, wire length required is 35.5 feet, given by this formula:

Length (feet) = 1005/Frequency (MHz)

I strung 35.5 feet of #14 enamelled wire on my support, with a height of 12 feet and width of six feet, propped up against the trunk of a large maple tree, oriented broadside east and west. The bottom of the loop was three feet above the ground. My HTX-100 sat on a picnic table twenty feet away, fed with RG-58U and powered with a 12-volt battery. There seemed to be no RF on the coax shield at the rig.

The maple tree affected the resonant frequency some, but my SWR readings made at the feed-point verified Lawson's data as interpolated:

MHz	SWR	MHz	SWR
28.0	2.8:1	28.6	1.10:1
28.1	2.8:1	28.7	1.20:1
28.2	2.2:1	28.8	1.40:1
28.3	1.5:1	28.9	1.60:1
28.4	1.25:1	29.0	1.90:1
28.5	1.15:1		

The receiver was full of signals, so I tuned around and found an IK4 calling CQ. I got him on the first call for a solid 549 QSO, the HTX-100 outputting three watts in low-power position. Switching to SSB and high-power, measured at 12 watts peak, I tuned around 28.8 MHz and heard a VE1 in N.S. calling CQ. He answered my call with a 5 and 3 report and solid 20 minute QSO.

I had no time for further experiments with the loop; I was convinced that the loop worked well when placed low to the ground and that it matched 50 ohm coax well.

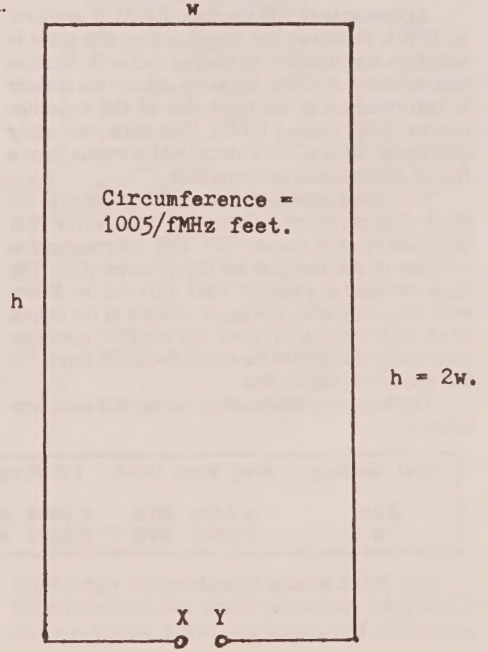


Fig. 2

A Frequency Counter for the HW-9

by Paul Levesque KB1MJ
14 Wesley St.
Dedham, Massachusetts 02026

The advantages of an accurate indication of operating frequency are familiar to all who have enjoyed this feature in their station equipment. Moreover, dial tracking is not one of the strong points of the Heath HW-9, for disagreements of over 5 kHz can exist regardless of one's best efforts to calibrate following the procedure given in the instruction manual. My frustration with this situation led to the design of a frequency counter for use with the HW-9 which is accurate, stable and requires only 60 ma at 12 VDC to operate. I chose to separately house the counter in a small enclosure thereby avoiding the complexity of invading the transceiver's cabinet.

CIRCUIT DETAILS

A single VFO is employed in the HW-9 to tune all eight bands. The instruction manual presents the following calibration procedure:

Dial Setting	Adjustment	Frequency at TP102
250	L118	5.7493 MHz
0	C1 (on tuning cap)	5.993 MHZ

Approximately 300 mv peak to peak is available at TP102. However, the impedance at this point is very high and sensitive to loading due to its location with reference to C202. Signal to operate the counter is best obtained at the input side of this capacitor (across 220Ω resistor R143). This node can easily tolerate the 30 pf of capacitance which results from a foot of shielded coax to the counter.

The analog section of the counter is shown in the block diagram, figure 1. The signal from the HW-9 is amplified by an N channel FET (Q6) and presented to one gate of the dual gate MOSFET mixer (Q8). The local oscillator is a bipolar VXO (Q7) and the difference frequency from mixing is selected at the output of Q8 by a lowpass LC filter. Q9 is a PNP transistor stage which conditions the signal to CMOS levels for input to the digital section.

The frequency relationships for the dial ends is as follows:

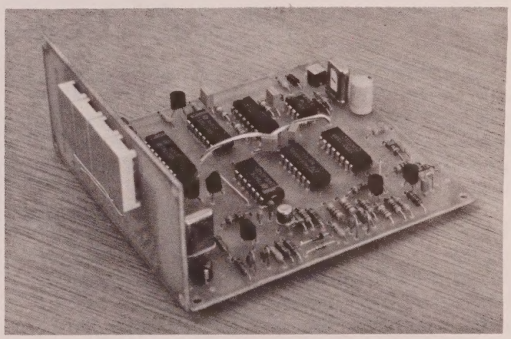
Dial Setting	Freq from HW-9	LO Freq	Freq to Digital Section
250	5.7493 MHz	6.9993 MHz	1.2500 MHz
0	5.9993 MHz	6.9993 MHz	1.0000 MHz

The digital section is implemented with CMOS ICs in order to conserve power And to minimize RF generation. The central unit in this section is a National 74C926 counter/display driver. The clock is crystal controlled and the various dividers and logic functions use 4000 family ICs. Four 0.3 inch seven segment high efficiency red LED displays present frequency with a resolution of 100 Hz. Figure 1 includes a basic block diagram of the digital section.

CONSTRUCTION DETAILS

The unit consists of two single sided PC boards, 3-1/2 inches wide, which are intended to be mechanically (and electrically) attached with 12 wire jumpers. They are at right angles to one another with a resulting height of 1-3/4 inches and an overall depth of 4 inches. The display board can be remotely located and cable connected to the counter board if desired. Cabinet details are left to the builder.

A 12 to 14 volt DC supply is required to operate the counter. This can be nicely accomplished using the Heath PSA-9 power supply since this supply has current to spare. A two-pin power connector in the counter cabinet and a short drop cable/connector to eh HW-9 provides an effective method of interconnection. An LC pi-section filter (2 x .01 µf and 10 µh) prevents digital switching from entering the HW-9. A power switch on the counter will be found useful if one intends to maximize battery life during portable operation.



Inside the frequency counter

CALIBRATION

The HW-9 achieves the required 700 Hz offset for CW reception by altering the beat frequency oscillator Q112 and therefore the VFO frequency remains unchanged from transmit to receive modes. An accurate test counter should connect across a 50 Ω dummy load on the

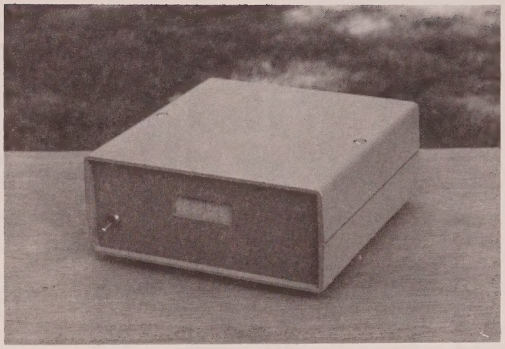
HW-9 output and the LO in the counter adjusted to match the transmitter output frequency.

Calibration using WWV at 10.0000 MHz on the 30 meter band is also possible. However, one must peak the audio beat note on WWV's carrier using the narrow selectivity position of the audio filter before adjusting the counter's LO to provide a 000.0 reading.

CONCLUSION

Several counters have been built with homebrew PC boards and have proven themselves in actual use. It is certainly nice to be on frequency for nets and schedules and to be able to QSY accurately when the need arises!

Complete schematics of the analog and digital sections are shown. Keep in mind that both sections occupy the one PC board and the display alone is mounted on the other (vertical) board. If you are interested in building a counter, I can provide a good quality 1:1 copy of my PC artwork, parts list with sources and crystal specs, and a parts placement drawing which should aid in duplicating my counter. My results with Meadowlake iron-on PC film have been good and its use is suggested. Please send $5 for the cost of the information packet, instruction manual and shipping/handling.



A typical plastic enclosure from All Electronics gives a finished look.

[Editorial note: Neither the QRP ARCI nor QRP Quarterly in any way warrant this offer.]

MJ-9 FREQUENCY COUNTER

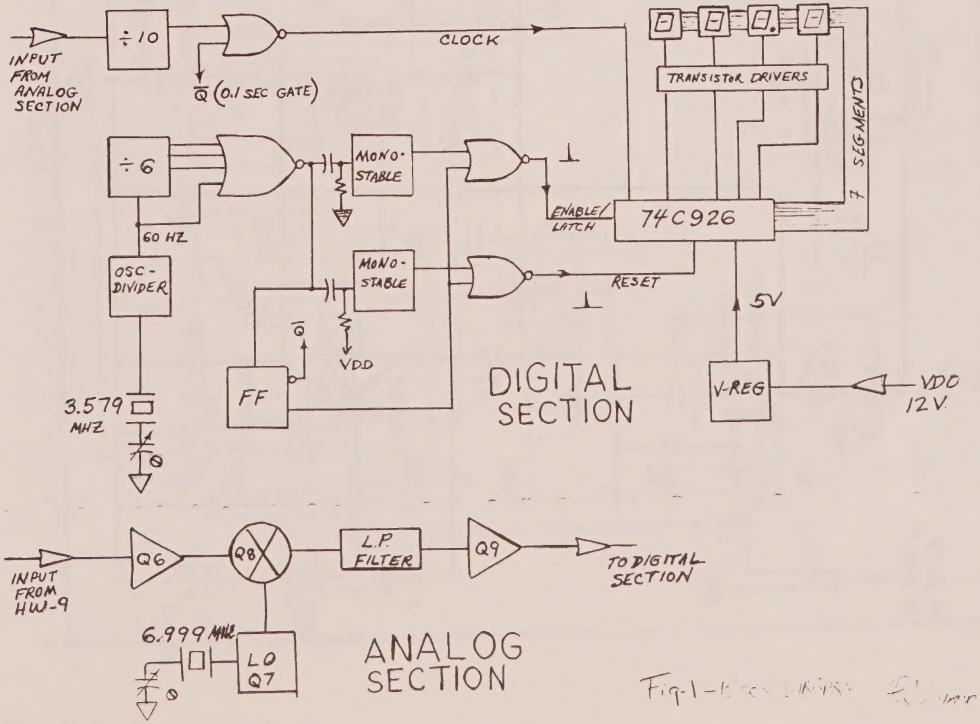


Fig-1-[illegible] 6-27-91

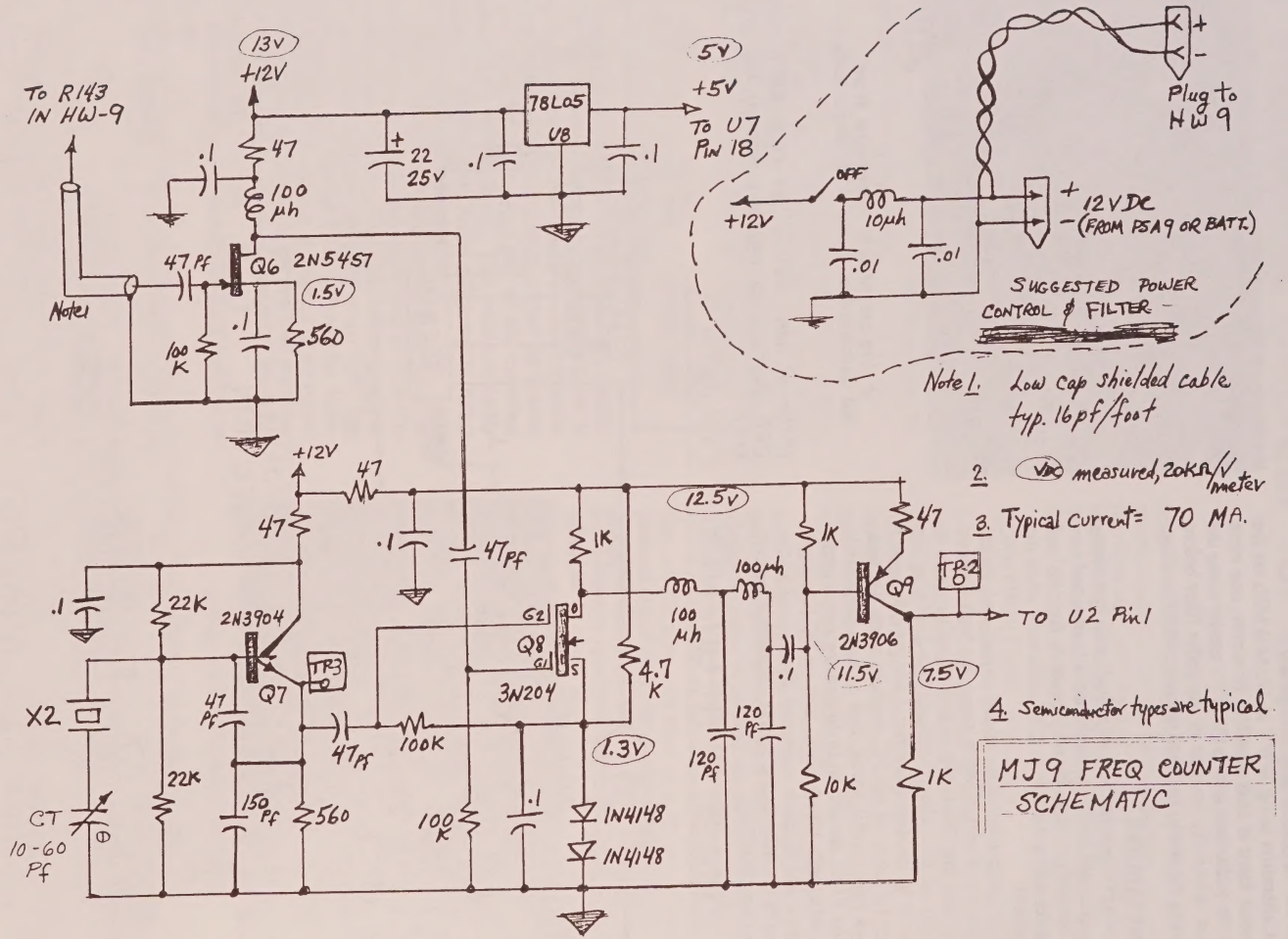


FIG 2 - ANALOG PORTION

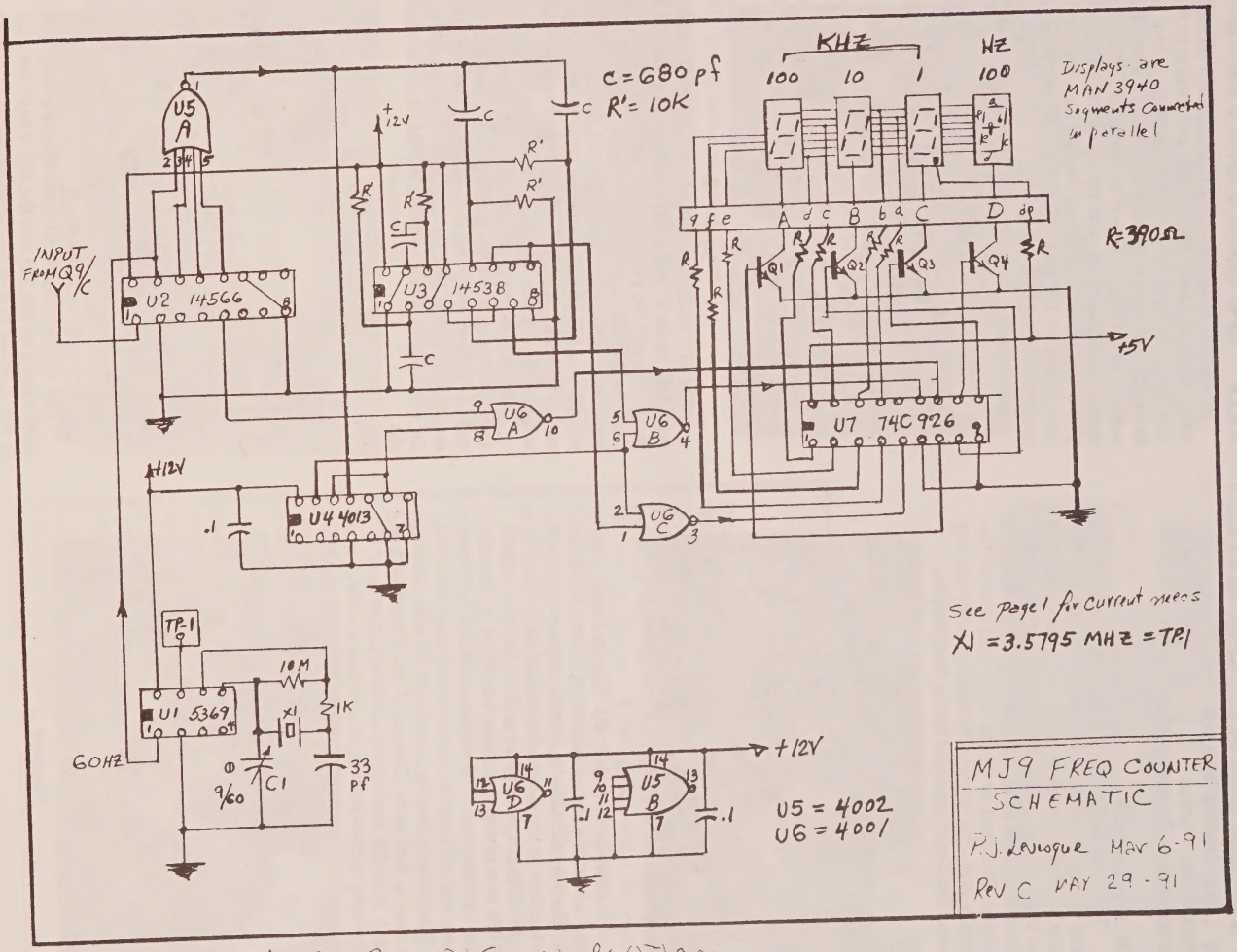


FIG 3 - DIGITAL PORTION

Product Review:

Frequency Counter for 509/515/HW-9

by Luke Dodds W5HKA
2852 Oak Forest
Grapevine, Texas 76051

UR Frequency??

The great majority of easily affordable QRP rigs have no digital indication of receive or transmit frequency. Thus we must resort to "calibrators". Most of the time this is sufficient to stay out of trouble. When things get tight, a digital frequency readout is helpful. The most desirable units read receive frequency and then transmit frequency with the key down. The model described herein does just that.

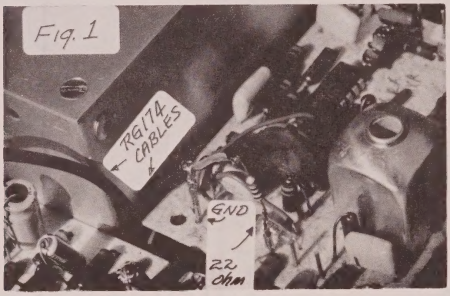


Figure 1

I became curious about the "Count Almost Anything" adverts by Grand Systems in Blaine, Washington. Their model GD-6B counter requires only two connections to the rig being modified (509-515-HW-9). At VFO output connect a 22 Ω resistor through RG174 to a phono connector labeled V on the rear panel of the rig. At BFO output connect a 1K resistor to the rear panel in the same manner using the label B. The resistors may be as small as 1/8 watt. Ground the coax at both ends. Connect V and B on the rig to V and B at the rear of the counter. Connect to 12 volts and you have a six digit frequency display.

Figure 2

Figure 1 shows the 22 Ω connection to the 509 VFO. Figure 2 shows the 1K ohm connection to the 509 BFO. The two RG174 cables must be passed to the underside of the chassis just behind the PTO housing as shown in figure 1. Figure 3 shows the chassis underside view with cables connected to the phono connectors. I removed the dial light switch in order to punch the two holes. The 509 rear view is shown in Figure 4.

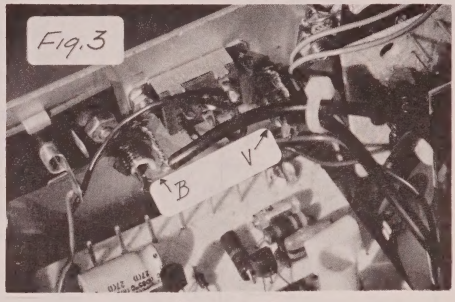


Figure 3

The 515 installation is a breeze. Figure 5 shows the 22 Ω resistor connected directly between VFO output pin and the phono connector. Figure 6 shows the coax and 1K resistor attachment to the BFO output. This coax is run directly toward the rear of the chassis to the B phono connector. This routing of the coax will not interfere should individual boards need removal. See Figure 7.

The protruding pins used on each board allow easy connection without soldering. I disassemble female MIL-type connectors found at fleamarkets and use the individual pins for connections as shown in the illustrations. Disconnecting the lead later is simple.

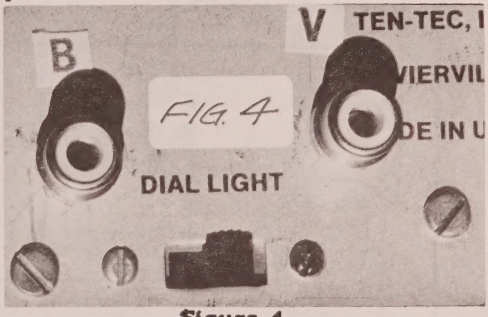


Figure 4

The GD-6B Grand Systems Counter functions satisfactorily on the 515 and the 509. I have not tried to use it on an HW-9 but have no doubt it will do

well. Figure 8 shows it in place on my 515. Models are available for other mixing schemes. All can be regular counters. Calibration is easy.

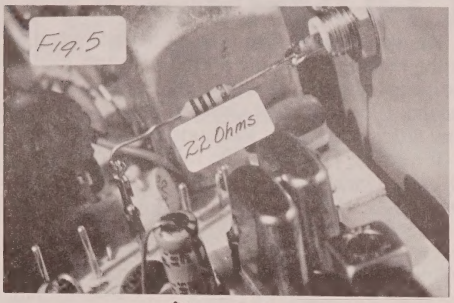


Figure 5

Grand Systems has written a procedure for the installation on the 515. My procedure differs in that I have actually done one. DO NOT connect the counter 12 volt power cord to the rear Ten-Tec 12V Aux. when using the basic 1.5 amp supplies. In worst case the counter pulls 380 ma (28.888 MHz).

I urge you to read "What Your Frequency Display Really Tells You" on page 28 of QST for August 1991. It may save you a pink ticket.

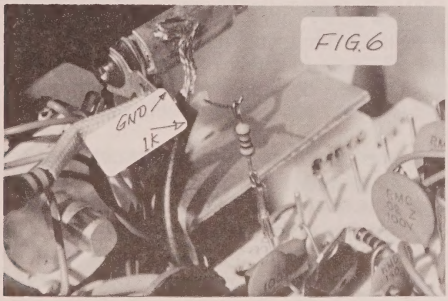


Figure 6

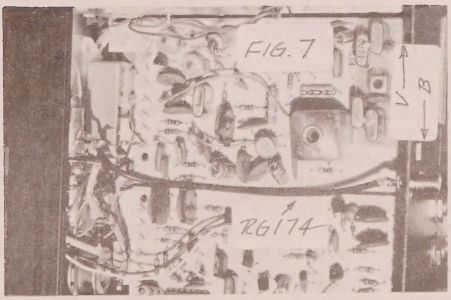


Figure 7

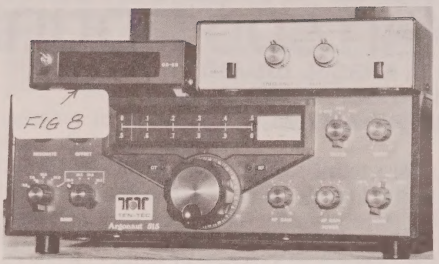


Figure 8

NEW COMPANY ANNOUNCEMENT

Tom Casey WA5ACF and Bill Hickox K5BDZ announced at the Dallas HamCom that they have started a new company called Tejas RF Technology.

The company sells complete electronic kits, including all parts, cabinets, building instructions, and operating instructions. Although they have more than 120 various designs on the drawing board, they are initially limiting their catalog to small receivers, QRP transmitters, QRP transceivers, and accessory items. Future items will include computer related and audio areas, antennas and other fun kits.

"Our kits will encouraging not only building, but modifying and experimenting," Hickox says. "We are starting this business on a 'shoestring' and all sales revenues will be reinvested back into the company to develop new products and increase our product line and inventory."

Casey and Hickox hope to start shipping their first kits in late August or September. They say they are not quitting their day jobs just yet so, for now, they prefer only written communications with those interested in their products.

"We plan to utilize 'correspondent engineering' in some of our products," Hickox says. "Both Tom and I feel the broad spectrum of design talent in the world could never be duplicated by a few staff design engineers. So 'correspondent designers' whose designs are accepted by Tejas RF Technology will share in any patents, profits, and (if preferred) name recognition associated with their respective product designs."

For more information write to Texas RF Technology at 17 South Briar Hollow Lane, Suite 101, Houston, Texas 77027.

THE SOMEWHAT LESS THAN 500 POUND CANARY

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You must recall the old Joke: "How does a 500 pound Canary sing? With a very loud CHIRP! CHIRP!"

Most of us tend to think of QRP operation as a mostly CW, sometimes SSB type of activity. While either mode is certainly fun and entertaining, there does exist another outlet for those times when regular operating, even in the QRP mode, becomes a bit routine. For about 18 months now I have been playing around with running AMTOR at the 5 watt or lower level. There are some real advantages to this mode over the more well known or traditional types of communications.

AMTOR is for all practical purposes error free. The sender knows immediately how well his "Chirps" are being seen by the receiver, by simple visual monitoring of the LED's on his multi-mode controller. Alternately the software driving the unit also can give realtime indications of the so called link quality. If too many "RQ's," that is requests for retransmission due to errors, are seen from either source, the transmitting operator simply increases power, switches to another antenna, or does any of the normal RF things that one might do in any other mode to allow a better path.

Remember that this is all done in real time. This means that just enough power can be run to maintain the link to an acceptable error rate. It is astonishing to establish a link, then quickly cut power down to QRP territory, only to see very little change, if any in the link quality. In practice, rarely do I have to run more than 5 watts. The receiving operator is not burdened with having to issue you some subjective report, inaccurate at best, grossly overrated at the least.

Another technique that I use is to connect to an automatic mailbox or MBX as they are called in the AMTOR world. After linking, power is dropped to the lowest level possible, where RQ's begin to be seen. Secondly a bulletin or other message is requested to be downloaded. Then antenna testing, or other changes in the station can be done while simply viewing the indicators as noted above. Instant antenna range!

A friend of mine recently went on a three month sabbatical with his petite mobile camper. He had no generator, only an auxiliary battery, and stayed in the same camp spot for days or even weeks on end. It followed that his power budget was small indeed. We had great fun by communicating in non-realtime. I would simply leave my multi-mode controller on, with the radio at 5 watts. He would link up at any convenient time and leave me a message. At times he would leave a message on one the MBX's.

Knowing that he was running 5 watts when he had left the message gave me a kind of warm fulfillment. Additional messages were left on MBX's in New Zealand, Hawaii, Grand Cayman Island, and of course many different stateside locations. Remote QRP!

It must be noted that the folks one meets on AMTOR are always courteous and very willing to help out a neophyte. After chasing DX in a pileup on todays Ham bands, especially at the QRP power level, one can quickly develop an attitude. AMTOR, and it's amiable, laid back way of operation can rejuvenate ones craving to operate and heal ones competitive wounds. Not that the mode is boring, many a spirited discussion can be found. The ragchews don't last for minutes either, but can go on for very long intervals. Even somewhat rare DX can be found chatting away the hours. No 59/59 QRZ QSO's are found here.

There are several digital multi-mode controller units on the market, along with many software packages to allow lots of fun and flexible digital operation on both the HF and VHF bands.

AMTOR operation may seem a bit strange at first, with its few funny sounding and unfamiliar acronyms. Don't let them throw you, though. Remember the first time that you heard a few HAM radio terms bandied about? It all seemed pretty scary then I know, and AMTOR really isn't even close to being all that complicated.

You too can be measuring your chirps in ounces rather than pounds. Some specific references on AMTOR operation are listed below. Give QRP AMTOR a try and put some of the zing and challenge of discovery back into the hobby. QRP

Interested in reading more about AMTOR? Try the following:

AMTOR Operating Primer, AN (Huff): Page 26 November 1989 QST

AMTOR Operation, A User's Guide (Newland): Page 31 October 1985 QST

AMTOR, an Improved Error-Free RTTY System (Martinez): Page 25 June 1981 QST

AMTOR, AX25, and HERMES, a performance analyses of three systems (W9JD): Page 63 December 1985 Ham Radio Magazine Comments: (G3PLX) Page 9 May 1986

Elmer's Notebook: an Introduction to AMTOR (W1SL): Page 101 September 1987 Ham Radio Magazine

Elmer's Notebook: An Introduction to Digital Communications (W1SL): Page 92 July 1987 Ham Radio Magazine

HW-9 Update

by Scott W. McLellan, ND3P
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[Editor's note: The following is reprinted from the Correspondence section of the May 1991 issue of QEX, the ARRL Experimenter's Exchange, copyright ARRL, and is reprinted with permission. The article referred to was reprinted in the April 1991 QRP Quarterly. If you correspond with the author, be sure to include a self-addressed, stamped envelope if you expect a reply.]

This is an update to my article which [first] appeared in the October 1990 issue of QEX, entitled "Modifications and Improvements to the HW-9".

Since I wrote "Modifications and Improvements to the HW-9" last summer, I have found a few improvements to my original suggestions, as well as solving one of the last "problems" (as far as I'm concerned) with the operation of the HW-9.

I had suggested adding a 180 pf capacitor from the collectors of Q405, Q406 to ground to suppress VHF parasitic oscillations. Being a "belt and suspender" kind of person, I left the capacitor there even though I found that beefing up the power bypassing (paralleling C445 with another 1 µf ceramic capacitor and a 0.01 µf mylar capacitor) effectively suppressed the parasitic oscillations. But the "cost" of leaving the 180 µf capacitor there was reduced output on 10 M. I removed the capacitor and the output power increased while no trace of the parasitic oscillations has returned.

I also mentioned adding a diode in series with the emitter of Q104 to suppress the interaction between the RIT and the transmit return adjustment (R131) from pulling the VFO; see page 5 of the QEX article [page 6 of April 91 Quarterly article]. My explanation in the article for adding the diode was not quite correct. Nor was the solution of adding just one diode.

Actually, I first found that the VFO frequency changed during transmit when the RIT control was turned to minimum resistance (counter clockwise). This caused the breakdown in the emitter-base junction of Q103, not Q104, to occur, changing the voltage to the variable capacitance diode D118. I then found that the transmit return adjustment interacted with RIT control during receive (due to Q104 breaking down), although this is less of a problem.

Therefore, I recommend that a diode also be placed in series with the emitter of Q103. A better solution is to simply replace Q103 and Q104 with n-channel MOSFETs. Remember to reset the transmit offset adjustment after any change.

The last of the "problems" with the HW-9 originally manifested itself as a change in pitch of a received signal after transmitting. I found as much as a 300 Hz shift in the pitch of a station I was in contact with immediately after signing over to that station. In addition, the pitch slowly changed to "normal" after a few tens of seconds. Similarly, the transmit frequency drifted during sending. The culprit was a shift/drift in the VFO frequency when going from transmit to receive and vice versa.

The shift/drift of the VFO was finally traced to D118, a 1N4002 rectifier, unconventionally used as a voltage variable capacitor for the RIT function. Evidently, Heath chose the 1N4002 for its relatively large change in capacitance over the voltage range of the RIT control (roughly 2 pf from 6.7 to 8.7 volts). However, for whatever reason, this diode caused the shift/drift. I replaced the 1N4002 with a more conventional MV2101 voltage variable capacitance diode. This eliminated the problem. As a consequence, though, the RIT range has been slightly reduced. To compensate, the resistance of resistor R127 (33K) may be reduced (I didn't bother) to 20K or so to allow for a greater RIT range.

The value of R127 should not be reduced too much; the minimum tuning (bias) voltage thereon should always be sufficient to keep the diode far away from conduction during the oscillation cycle of the VFO. This can be checked by measuring the oscillator output voltage (TP102) while the RIT control is changed. Should the output voltage change at the minimum setting of the RIT control (fully counter clockwise), the resistance of R127 is too low.

While the shield is off to replace D118, I took the opportunity to drip some wax onto the capacitors to add rigidity and reduce microphonics. Obviously, after any of the above changes, the VFO must be recalibrated per the instruction manual.

Idea Exchange

Michael A. Czuhajewski WA8MCQ
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Severn, Maryland 21144

Address of the Quarter

This has become a regular feature of the column. For the third and hopefully last time, please note the address above, which supersedes the one in the last issue. (This was also the Address of the Quarter two issues ago.)

The Demise of WA8MCQ/DU3

As mentioned last issue, I reported for a 12 month unaccompanied tour at Clark Air Base in the Phillipines in late March. A week after my arrival, Mount Pinatubo started venting steam. In early June, things started escalating quickly, and all family members and most military personnel were evacuated 40 miles away to Subic Bay Naval Base on 10 June. I was one of the 1,500 mission essential people who remained behind. Two days later, a long series of eruptions began. The "Clark 1500" shared some unique experiences. These include:

•Three days of numerous high speed, panic, emergency evacuations to the far side of the base (and sometimes beyond) every time the mountain burped, sometimes several in the same night, ignoring all traffic laws and signs while watching the rear view mirror for possible fireballs, with heartbeats triple the normal rate. (As it turned out, those first nine or so nuclear bomb-style mushroom clouds were just wimpy labor pains compared to what was to come.) My picture of the very first eruption was taken during the first minute or two; the cloud eventually reached 80,000 feet.

•Sitting out the BIG blast of 15 June (when it blew its top completely) at the Pampanga Agricultural College, on the slopes of another mountain 10 miles further away, with an hour of complete darkness during the worst part of the ash fall (yes, it's really true what they say on TV!), and having several thousand civilian refugees trickle in behind us. At the 4 p.m. meeting called by the commander, we were told that there had already been 15 eruptions that day.

•Returning to a waterless, powerless and completely gray Clark Air base three days later, mud and ash everywhere, to shovel six inches of wet ash off roofs for the next three days to keep even more of them from collapsing from the weight, while the volcano continued to erupt several times a day, every day. Although one of those eruptions resulted in another 30 minutes of total darkness in the afternoon, most only produced annoying showers of ash with the consistency of talcum powder, along with the constant smell of sulfur. (The fallout from the big blast which reached the base was for the most part the consistency of coarse sand and smaller.) The major blast smelled like Hell (pun quite intentional), it was not particularly dangerous anymore.

I was one of many GIs who were subsequently evacuated back to the States after they decided to sharply reduce the number of people stationed there. (It was later decided to abandon the base by September 1992.) All family members had been sent back to the States before us. Fortunately, I was there without my family, which simplified things considerably. I didn't have to worry about getting them out, nor worry about abandoning my entire household.

Unfortunately, I got back after the July Quarterly had gone to press, so it was too late to retract the APO San Francisco address. It's no longer valid; anything sent there after late May was returned to sender or lost in the shuffle. Since I had to abandon my computer and many of my QRP files, most things that were sent to me, regardless of address, any time after the middle of March are now lost. If you sent me any inputs and they don't appear in this or the last issue, please send them to me again. In the meantime, please use the address at the top—I'll try to keep this one for a while.

In case you were straining your ears to hear a faint "WA8MCQ/DU3 QRP" and never heard it, it was never there in the first place. I finally put in my papers for the reciprocal license and the First Annual Phillipine Volcano Games started ten days later.

New Phone Number

I moved about a year ago and got a new number, which some may not have received. The old one has since been reassigned to someone else. Now the phone company is changing the area code, effective 1 November 1991. On that date I can be reached at 410-551-1633. (Until then, my area code is 301.)

What's a CØG Capacitor?

Some time ago I overheard a couple of hams discussing an article in SPRAT, the G-QRP Club equivalent of our QRP Quarterly. They were puzzled over something referred to as a "CØG capacitor" and didn't quite know what that meant—perhaps some peculiarly British term? I knew, since I had to dig it out myself a few months earlier. It's not British, it deals with temperature coefficients. Although you can still use the ever popular "traditional" designations such as NPO, N33Ø, etc., the Electronic Industries Association (EIA) has its own system. CØG is the same as NPO. It's also the same as seeing a little dab of black paint on the top of a disc capacitor, which is another method of indicating the coefficient. (Important note: the body color of a ceramic capacitor does NOT indicate the coefficient, only the dab of paint on top, if there is one.) In case you were wondering, you're right, the EIA system is more cryptic and not self-explanatory like the old one.

"Traditional"	EIA	Paint Color (not body color)
NPO	CØG	Black
NØ33	S1G	Brown
NØ75	U1G	Red
N15Ø	P2G	Orange
N22Ø	R2G	Yellow
N33Ø	S2H	Green
N47Ø	T2H	Blue
N75Ø	U2J	Violet
N15ØØ	P3K	
N22ØØ	R3L	

For the beginners, N33Ø means that for every degree Centigrade the capacitor warms up, the value will decrease (negative coefficient) by 330 parts per million, N75Ø by 750 ppm, etc. An NPO is nominally zero ppm, although the tolerance on that is generally +/- 30 ppm—still a lot better than the 10% or 20% of some garden variety discs! (20% is 200,000 ppm.)

The next time you're digging through a pile of bargain disc capacitors at a hamfest, or shaking a bubble pack assortment at Radio Shack to see if there are any good ones inside, don't just look for the letters NPO—keep an eye out for CØG and/or the little dab of black paint. Your next VFO project will thank you for it.

Beware the Toothless Alligator (Leads)

Not exactly toothless, actually—solderless. I learned this one the hard way in the service shop at Maryland Radio Center. We use a lot of those jumper leads with insulated alligator clips on the ends, the same type that homebrewers use. As always, the marketplace is competitive, costs are rising all the time, and manufacturers have to shave expenses somewhere. It takes a lot of time and money to solder the wries onto those clips—they could save a lot by simply crimping them on, without solder, and they do.

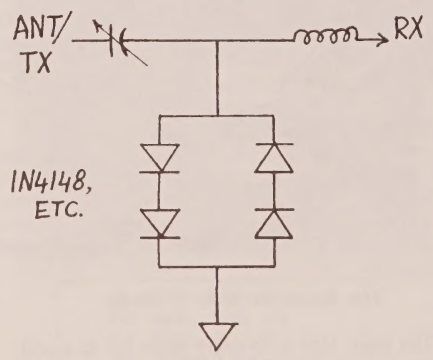
They may work fine for a while, but sooner or later the laws of physics will catch up with you and start giving intermittent or open connections, something you don't need when experimenting. Don't throw them away—just slide back the plastic boot and solder the wires in place. Even better, go ahead and automatically solder them as soon as you bring home a new batch. They should be easier to solder, too, since they won't have had time to build up any oxidation. (I just bought a set of Radio Shack jumpers. Although those needed to be soldered, too, I found that the crimp looked more substantial than some of the "no-name" leads I'd bought in the past.)

Electronic T/R Switch

From Dave Benson NN1G of Newington, CT:

After building a "crunch proof" receiver for 40 meters, I was dismayed to discover BCI (breakthrough) returning when I added a T/R switch to support QSK transceive operation. I'm using the circuit popularized by W7EL, a tuned series L-C and back to back diodes for a simple but low-loss switch. Unfortunately, the diodes in this switch may conduct under worst-case (night time) conditions, causing unwanted garbage.

If you discover your homebrew receiver is degraded by adding a T/R switch, you might try the simple fix below before resorting to relay switching or more complex solutions. By replacing each back to back diode with two (or more) series diodes, the conduction threshold is raised, improving the immunity to overload. Since the original circuit delivered only about 150 mV peak to peak (key down) into a 50 Ω circuit without fear of component damage.



NN1G T/R SWITCH MOD

Insulator for Capacitor Shafts

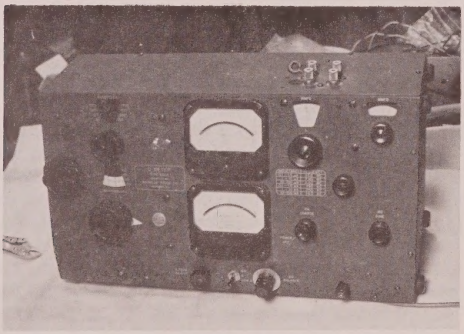
From Dick McIntyre K4BNI of Basye, VA:

During construction of a QRP antenna tuner, I needed to insulate the capacitor shafts from the panel and cabinet. Lacking insulated couplers and not desiring to pay the price of new ones plus shipping and handling, I cut a two inch length of plastic soda straw and wedged one end over the capacitor shaft and the other over the drive shaft. By leaving a quarter inch between metal, I had my coupler. My capacitors are of the broadcast receiver type with easily turning shafts, and capacitors with shafts having greater torque may not adapt to this method. Give it a try anyway—it's cheap!

The Q-Meter, The Homebrewer's Friend

Please forgive the hokey title, but anyone who really knows and understands these devices knows how useful they can be. There are many fine, modern digital Q meters available but you'd have to postpone purchase of your next car to get one, and you don't really need such accuracy and bells and whistles at home anyhow. On the other hand, there's nothing wrong with an older, analog unit, such as the Boonton 160A and 260A.

I acquired a 260A last year and found it to be extremely useful and versatile (although extremely large and heavy). What can you do with one? Measure inductance of coils at the frequency they will be used at, measure their Q (quality factor) and measure capacitance. (Actually, it measures the apparent inductance, which is the true inductance as modified by the distributed capacitance of the coil, another characteristic you can measure.) It also functions as a calibrated 30-460 pf variable capacitor, with resolution to much better than 0.1 pf on the +/- 3 pf fine tuning cap, and includes a wide range variable frequency oscillator, covering 50 kHZ to 50 MHz.



The Boonton 260A Q Meter

The basic idea is to apply some RF to a coil, resonate it with a variable capacitor and observe the voltage rise at resonance. From this you can determine Q by reading the meter and find inductance, either directly from the scales on the unit (260A only) or by plugging values into a formula. You can also measure capacitance. Connect a coil, set the capacitor near maximum, vary the frequency until you have resonance. Now connect the unknown capacitor, which throws the circuit out of tune. Reduce the Q meter capacitance until you have resonance again. The amount that you reduced it is equal to the unknown capacitor.

The picture will help you identify the 260A at hamfests. Boonton also made the model 160A, which is older but similar; among other things, the meters are round and different sizes, and the dials are on the outside of the cabinet instead of peaking out through windows. I saw another Boonton Q meter at a hamfest once with a number between these two, but it's a VHF version. (Details are sketchy, but I believe there might be two VHF versions, models 170A and 190A.)

Both devices use vacuum tubes, and it would be a good idea to pick up a few spares if you can find them at hamfest. This particularly applies to the detector tube, which is the same in both units; it's one of those old 6-pin tubes with grid cap on top. The 260A otherwise uses relatively new tubes, with 7- and 9-pin miniature bases. The December 1989 issue of Ham Radio magazine had a good article by W3QOM on Q meters, including replacement of the ancient tubes in the 160A with some which are merely old. Replacement of the detector tube is also applicable to the 260A. (The article also contains a picture of the 160A.)

160A tubes:
- 5Y3 rectifier
- 45 oscillator
- Boonton 535A detector (2A6)

260A tubes:
- 6X4 rectifier
- 0A2 regulator
- 0B2 regulator
- 5763 oscillator
- Boonton 535A detector (2A6)

Actually, there were three Boonton Q meters in the HF region, though I only recently heard of the model 100A. It was introduced in 1935, the 160A in 1939, and the 260A in 1953. I know nothing about the 100A, nor the VHF model(s), which appeared to be of similar vintage, to the 260A. Either the 160A or 260A should be suitable, though I'd recommend the latter. Price? According to a 1963 Boonton brochure, the 260A cost $990. My folks bought a new Chevrolet that year for only twice that amount.

The 260A was considered a laboratory grade instrument at one time; although technology has come quite a way since then, it's still a good unit to have. I've seen some advertised by dealers for $150 to $200,

which is probably top dollar, but you should be able to pick one up for considerably less, depending on condition and your negotiating powers. W3QOM mentioned a figure of under $50. When doing your bargaining, don't forget to point out that even the newer 260A is an antiquated device for which parts are hard to find—tubes, high voltage transformers, high voltage electrolytic caps, etc. They don't need to know that it's such a useful device that you'd sell your grandmother to get one.

An important consideration is the thermocouple; ask the seller if he knows whether it's good. When measuring Q, you set the level of the oscillator to a precise value on the lower meter, which is driven by the thermocouple—RF energy flowing through it results in a proportional DC output. It can be burned out by excess drive and if it is, the unit isn't worth much and the price should drop accordingly. (It's still quite usable though, so don't pass it up—details later.) I was told that there is still a company which will replace the thermocouple and calibrate the 260A to the new one for about $200. (They won't sell the thermocouple by itself.) One of the improvements of the 260A is that it's harder to burn out, and the oscillator level is deliberately limited to well below the burn out point, as long as you keep the needle on the scale.

The lower meter is "MULTIPLY Q BY". The top meter, which is essentially a vacuum tube voltmeter connected to measure voltage rise at resonance, is calibrated in Q from 0 to 250. (Q is a unitless measurement.) If the oscillator is set to the X1 mark on the lower meter (which is near full scale), the top meter scale is read directly. If you are measuring something with a Q higher that 250, you crank down the oscillator level to X1.5, X2, or X2.5. This gives an effective full scale Q reading of 375, 500 or 625.

If the thermocouple is burned out or otherwise defective, the unit is not useless (but don't tell this to the seller!). You cannot accurately set the multiplication factor, so you can't use the Q scale directly. However, you can still measure the Q by another method, detailed in the W3MT article in the May 1984 issue of QST. Tune the variable capacitor for resonance at the frequency of choice, and note the meter reading on the Q scale, whatever it is. (For maximum accuracy, adjust the oscillator level to give a reading as high as possible on the Q scale.)

Next, increase the capacitance until the reading drops to 70.7% of that value and record the picofarads, Decrease the capacitance back through the peak and continue until it onces again shows 70.7% of the peak value, and note the new capacitance. See figure 1. Divide the sum of these two by the difference between them to get the Q; e.g. for values of 120 and 130 pf, the Q would be (130 + 120) / (130 - 120) or 25.

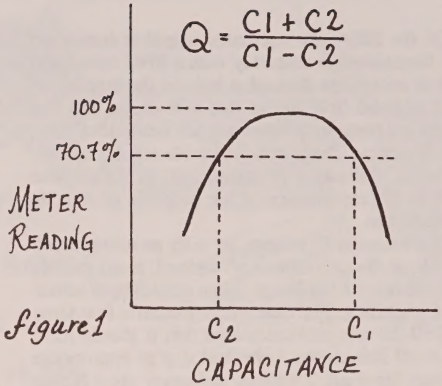


Figure 1

If simply measuring inductance or capacitance, the oscillator level is not critical--just look for a peak reading on the Q scale, which indicates resonance; the actual value is unimportant. Use any level that gives a usable reading on the Q meter; the thermocouple is only needed when reading Q directly from the scale, to give proper calibration. With the thermocouple burned out the price of the unit should drop considerably, and yet, as you can see, it remains quite usable! (Realistically, most homebrewers probably have little more than academic interest in measuring Q anyhow; inductance and capacitance are usually of greater importance to the typical builder.)

Not only is the 260A newer and better looking than the 160A, it's easier to measure inductance. On the 160A you set the frequency and tune the variable capacitor for resonance. To find the inductance, read the capacitance on the dial, and plug that and the frequency into the standard inductance formula. Things are simpler on the 260A—not only is the capacitor dial calibrated in picofarads (though marked "micromicrofarads") it also has an inductance scale, from 0.95 to 13, so no calculations are required as long as one of the standard test frequencies is used. The scale multiplier is read from a chart on the front panel, according to frequency. For instance, if the oscillator is set to 7.9 MHz, the inductance scale on the capacitor dial indicates 1 to 10 µh (plus some overlap, 0.95 to 13 µh).

Note that while the inductance scale is only accurate when certain specified frequencies are used, you can still measure inductance at any frequency by plugging the values into the formula. (Q, of course, is measured at whatever frequency you want.) The test frequencies and inductance ranges of the 260A are:

25 MHz:	0.1-1.0 µH
7.9 MHz:	1-10 µH
2.5 MHz:	10-100 µH
790 kHz:	0.1-1.0 mH
250 kHz:	1-10 mH
79 kHz:	10-100 mH

On the 260A, the oscillator output is connected to the thermocouple assembly with a BNC connector, which is accessible through a hole in the rear of the case. I added a BNC tee to this connection so I can hook up my frequency counter when needed for maximum accuracy. There is a detectable effect on readings when the cable is connected, probably due mainly to the capacitance of the four feet of RG-58, but it is slight.

The Boonton Q meters, as with anything using the "voltage rise at resonance" method, aren't perfect as I found out the hard way. Some coils simply refuse to give a reading. For example, I wound a few turns on a T50-26 core and calculated that it should have about 4 µH inductance. I checked it at an appropriate frequency for 4 µh, 7.9 MHz. and never got a flicker on the meter. I tried the ranges on either side, using 2.5 and 25 MHz, and still nothing. I put the coil on a $150 handheld LCR meter and a $5,000 Hewlett Packard digital LCZ meter, and got readings of about 4 µh on both of them.

The problem? The frequency was appropriate to resonate 4 µH with the 30-460 pf capacitor in the 260A. Unfortunately. it turns out that type 26 powdered iron material is designed for power line frequencies, and is a low Q material to boot. By the time you get up into the MHz region, the Q of the material is microscopic, as is the voltage rise at resonance. Technically, it was a good coil since the winding had continuity and there was a certain inductance, but the frequency was inappropriate for the core material. I could have switched the meter down to a lower, more appropriate frequency for the core material, but then the inductance of this particular coil could not be resonated with the 30 to 460 pf capacitor in the 260A.

I also had the same problem with some coils wound on type 43 ferrite cores. As with the type 26 core, the two other devices did give readings since they test at 1 kHz. (This touches on the issue of testing coils at the standard 1 kHz test frequency versus the frequency at which they will be used, which is a can of worms I prefer to leave unopened for now since this column is already getting too long.) Aside from "problems" like this, the voltage rise at resonance method used in the Boonton meters is basically a good, sound and classic one.

Where to get technical information on this outdated but extraordinarily useful device? I've solved that one for you. I put a cry for help in QST and received about 20 replies, including offers of help as well as several copies of the manual for the 260A. (Unfortunately, all but one of those were abandoned when I was evacuated from the Philippines.) In addition, I received several articles from the Boonton Notebook series of the 50's, as well as the test and alignment manual for the 160A/260A. (The latter includes schematics of both units.) If anyone needs photocopies, I can provide them at cost.

It's great fun playing around with various coils and experimenting, but how about a practical application? I built some low pass filters with toroids for 20 and 40 meters once and ran frequency response tests. They didn't work as expected, giving high insertion loss at the design frequencies. I wound the coils according to the recipes, with the number of turns called for, but the inductances were off. After I got the 260A, I adjusted them to get the correct inductance. New frequency response tests showed they now work as expected.

I later built a low pass filter into a 10 meter QRP rig, using the meter to adjust the inductances before installing them. Once again, wound according to the recipe, the inductances were off. When I tested the rig on a spectrum analyzer I found the filter worked properly off the bat.

Some related articles for further reading on measuring inductance and capacitance:

- A Crystal Controlled Q Meter, W3MT, QST, May 1984. Measures Q at three crystal controlled frequencies; also measures inductance and capacitance.
- A Simple L-C Meter, W3MT, QST, February 1983. Measures L and C at two crystal controlled frequencies.
- Capacitance and Inductance Measuring Devices, KB4ZGC, QST, February 1980 (Hints & Kinks). Separate crystal controlled devices to measure each parameter.
- A Tester for Coil Inductance, W1FB, QST, April 1986. Dual range, crystal controlled tester.
- Measuring Inductance and Capacitance with a Reflection Coefficient Bridge, W6ZGN, QST, May 1982. Adapter used with previous device by same author ("A Reflection Coefficient Bridge---Impedance Matching Measurement the Easy Way", QST, October 1981). Used in conjunction with signal generator at chosen frequency.
- A Simple Inductance Meter by KH6CP/1, based on a W1FB design, ARRL Handbook for 1989, 1990 and 1991, Test Equipment and Measurements chapter. Measures inductance using four fixed frequency LC-tuned oscillators.

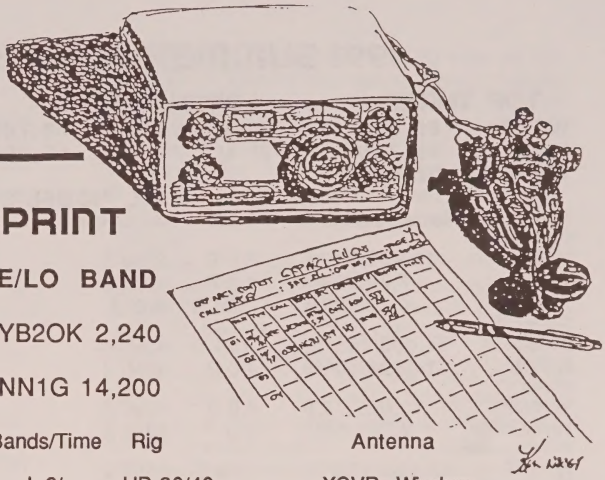
I've found the 260A to be an extremely useful and fascinating device, and it quickly became the favorite toy in my workshop. Anyone who is seriously interested in the more technical side of homebrewing should strongly consider picking one up if they have the chance—it's well worth it.

The Fine Print

That's about it for this issue. (Unfortunately, we don't get paid by the page.) Don't forget, this is your column as well as mine, and everyone is welcome to send in their technical tidbits that aren't large enough for regular articles. If you have a good one but don't want to write it up, send in the basic idea and we'll take it from there and give you full credit. Either way, please share your expertise with the QRP community, and keep those cards and letters coming to the Address of the Quarter.

Contests

Red Reynolds, K5VOL
835 Surryse
Lake Zurich, Illinois 60047



1991 HOOT OWL SPRINT

TOP THREE **SINGLE/LO BAND**

1 W3TS 66,040 40 M YB2OK 2,240
2 K3TKS 38,520
3 N1BYT 22,740 LO-B NN1G 14,200

Call	Score/Points/SPC	PWR	Bands/Time	Rig	Antenna
Connecticut					
NN1G	14,200/ 50/ 8	5.0 B	L-2/ -	HB 80/40	XCVRs Windom
Maryland					
K3TKS	38,520/ 107/ 18	.90 S	A-3/ 3	Argo 509	Loop/Vert
Massachusetts					
N1BYT	22,740/ 43/ 9	.80 S	A-3/ -	HB XCVR's (S)	Loop
KB1MJ	315/ 15/ 3	5.0	40M/ -	HW-9	Dipole
New Jersey					
W2JEK	10,560/ 20/ 4	4.0	L-2/ 1	2-FER	Dipole/Hertz
New York					
WA3INC	1,400/ 40/ 5	5.0	40M/ -	TS-940S	Vertical
Oklahoma					
WD5GLO	1,386/ 22/ 6	3.0 B	A-2/ 2	Argo 509	Yagi/Inv V
Pennsylvania					
W3TS	66,040/ 116/ 22	.90 S	A-3/ 3	HB XCVR(S)	Yagi/Tee/Dp
Indonesia					
YB2OK	2,240/ 40/ 8	5.0	40M/ 3	TS-430V	Inv Vee/Loop

****

Time of operation rounded to nearest hour (SPC) = States/Provinces/Countries
S = Solar / natural B = Battery power
(Dp) = Dipole (Lw) = Longwire /m = Modified
(A-) = All Bands (160-6) (H-) = High Bands (20-6) (L-) = Low Bands (160-40)
(S) = Superhet (IV) = Inverted Vee HB = Homebrew

****

The Hoot-Owl still has problems with time of operation. Some of the entries used 2000-2400 UTC! The correct time is 2000-2400 LOCAL. That is 8 p.m.-Midnight at your location. Entries using 2000-2400 UTC were not disqualified this time, but will be next year.

****

For the Homebrew contest bonus points, homebrew gear must be used but the bonus points apply to the contest entry only. The Homebrew gear used need not be built by the user! The use of borrowed gear, gear built by one for another, or purchased at a swap-meet or hamfest (risky at best) is perfectly fine. Homebrew gear and bonus points should be available to everyone if the desire to use it is present. With the single-band entry category, a 40 Meter only homebrew rig is not a handicap against multi-band entries.

1991 SUMMER HOMEBREW SPRINT

TOP THREE		SINGLE BAND			HI/LO BAND		
W3TS	159,000	40 M	YB2OK	75,700	LO-B	KA1UEH	4,032
YB2OK	75,700	20 M	AA5HN	17,096	HI-B	KF7MD	15,490
WB2QAP	66,405						

ALL HOMEBREW

Call	Score/Points/SPC	PWR	Bands/Time	Rig	Antenna
California					
W7UAB	12,455/71/10	5.0 B	20M/ 2	HB K9AY	Yagi
N6GA	7,720/34/4	1.0 S	20M/ 2	HB Micro20 XCVR	Yagi
AA6LM	6,320/22/4	.90 B	A-2/ 3	HW-8/m	Inv Vee
Connecticut					
KH6CP/1	37,000/160/10	.44 S	40M/ 4	HB XCVR(S)	Dipole
NN1G	14,828/104/9	4.0 B	40M/ 2	HB XCVR(S)	Windom
Illinois					
W9NJP	11,048/72/8	4.0 B	40M/ 2	HB XCVR	CF Zepp
WA9QMO	7,793/57/7	5.0	40M/ 2	HB XCVR	Loop/End Fed
Massachusetts					
N1BYT	43,060/173/11	.90 S	40M/ 4	HB XCVR(S)	Loop
New Hampshire					
KN1H	66,300/171/15	.90 S	A-3/ 4	HB TX/RX(S)	Dipole
New Jersey					
W2JEK	11,229/39/3	2.9 B	A-2/ 1	HB 2-FER	Dipole/Gp
New York					
K2LGJ	14,160/52/8	.90	A-2/ 3	HB W7EL-40 HB XCVR-20 (Z01/2FER)	Yagi/Vert
N2MAU	9,365/52/8	4.8 B	20M/ 3	HB K9AY	Vertical
Pennsylvania					
W3TS	159,000/ 260/ 30	.90 S	A-6/ 4	HB XCVR(S)	Yagi/IV/Tee
Washington					
KF7MD	15,490/61/6	.90 B	H-2/ 3	HB XCVR(S)	Loop
Quebec					
VE2BLX	18,230/120/10	5.0 B	40M/ 3	HB Mavti-40/m	Longwire
Indonesia					
YB2OK	75,700/202/25	4.0 S	40M/ 4	HB TX/RX(S)	Loop/Vert/V

MIXED

Texas					
AA5HN	17,096/96/9	5.0 S	20M/ 4	HB A&A 20M/ Argo 2	Yagi
Virginia					
N3OS	17,484/158/14	2.5	40M/ 3	HB TX-12BY7/ SB-301	Loop

ALL COMMERCIAL

NewYork					
WB2QAP	66,405/233/19	.90 B	A-3/ 4	Argo 2	Yagi/Inv Vee
WA3INC	2,646/42/9	5.0	20M/ 3	TS-940S	Vertical
North Dakota					
N9FVN	9,660/69/10	4.0 S	20M/ 4	HW-9	Vertical
NN9K/Ø	1,638/39/4	4.0 B	40M/ 4	Argo 509	Inv Vee
Maine					
KA1UEH	4,032/64/6	5.0 B	L-2/ 1	HW-9	Dipole
WA1WPR	2,993/57/5	5.0 B	40M/ 1	HW-9	Dipole
Maryland					
K3TKS	7,280/52/7	.90 S	40M/ 1	Argo 509	Loop
Missouri					
WØGWT	2,401/49/7	2.0	A-2/ 2	IC-735	Random/Vert
Virginia					
N4ROA	8,411/89/9	2.0 B	40M/ 3	HW-8	Dipole
Ontario					
VE3KQN	22,275/135/11	.90 B	40M/ 3	Yaesu FT-77 ---	

PRESIDENT'S MAILBOX...

(continued from page 2)

My phone number is 317-842-8087. My packet address is WN9A @ N5AAA.IN. I would be interested in hearing from anyone who has an Argonaut 2 or Delta 2. (Larry's mailing address is 11560 Timberlake Lane, Fishers, Indiana 46038.)

QRP RTTY

In the April 1991 issue, I mentioned that I received a query from a California member regarding QRP RTTY operation. Jerry Bartachek KDØCA (1114 Deforest, Iowa City, Iowa 52240) wrote with some more thoughts on the subject:

I am writing in response to your "From the President" column in the April 1991 QRP Quarterly. I run QRP on RTTY, AMTOR FEC and AMTOR ARQ modes from time to time. I must admit my usual QRP activity is CW, but when band conditions seem better than normal, signals are coming in louder or a contest is on, I go QRP in the digital modes.

I have enclosed an excerpt from my log covering all of 1990 and 1991 to date for the RTTY/AMTOR QSO's which were QRP.

By the way, I talked to Millard K6ZRY 2-way QRP RTTY recently and he brought to mind your column wherein you quoted his query about QRP RTTY activity.

I find that there are times when the bands are not too great and no matter how hard I try, I cannot maintain an ARQ link with low power. However, the usual power range used by AMTOR ops is between 30 to 50 watts. KW stations on ARQ wipe out the whole RTTY segment with splatter. Some, I suspect are using QRO plus compressors on AFSK, (sending audio sigs to the mic jack) which is a definite NO-NO! Low power, no clippers, no compressors, no processors is the way it is done best. I prefer to use direct FSK, since my Icom 740 has provision for it. I can use my 500 Hz filter that way, and reception is enhanced.

I suppose I could use QRP for 80 or 90% of all my stateside RTTY QSO's, but my comments about not making the link are usually on DX circuits. I have made very successful DX QRP RTTY and ARQ QSO's as my log testifies.

I've been on RTTY/AMTOR since October 1986. My ideas for a QRP RTTY frequencies would be 90 kHz above the bottom end for most bands (like 14.090). It would be off the usual packet frequencies, and is easy to remember as it is an even number of sorts. It *is* legal to use ARQ on RTTY sections of the band, although user conventions put ARQ below 14.080 kHz. So the QRP meeting places would be: 3.590, 7.090, 10.125? (10.140 is too close to packet operation and several ARQ MBX's and BBS's are on 140), 14.090, 18.090, 21.090, 24.925? (still 10 kHz below the SSB area and there is no RTTY activity on 12 meters to speak of), and 28.090.

My use of the 30 meter center fed zepp dipole with TV twinlead feeder with handpunched rectangular holes for lower loss was necessary on bands where resonant antenna does not exist. I also used the min-zepp at times just to see if QRP worked using less than optimum antennas.

New Member / Renewal Data Sheet

Full Name _____ Call_____ QRP Number_____

Address _____

City _____ State or Country_____Postal Code _____

[ ] New Address?
[ ] New Call?
Amount enclosed $_____
** Please do not send cash! **

[ ] New Member (U.S. $12.00, DX $14.00)
[ ] Renewal (U.S. $10.00, DX $12.00)
Please make your check or money order payable to: QRP ARCI.
Note: Renewals must be received 30 days before publication.

New Member Applications Only:
License Class_____ Age_____
Year 1st Licensed_____
Other Calls Held_____
Rig_____ Ant_____
Bands Most Used_____
Please circle your chief interests:
Ragchewing, DXing, Contests, Traffic, Awards, Homebrew, VHF/UHF, Packet, CW, SSB, RTTY, ATV, Satellite, Other.

	Yes	No	Maybe
Would you like to be an officer/director of club?	[ ]	[ ]	[ ]
Would you help write for the QRP Quarterly?	[ ]	[ ]	[ ]

What subjects_____
What QRP awards/achievements have you won?_____
_____
Why do you run low power? _____

Mail to: **Mike Kilgore, KG5F**
2046 Ash Hill Rd.
Carrollton, TX 75007

UPCOMING CONTESTS

1991
FALL QSO PARTY (CW)
OCT. 19, (1200Z), TO
OCT. 20, (2400Z)
***

HOLIDAY SPIRITS SPRINT
(CW)
DECEMBER 1,
2000-2400Z
***

1992
WINTER FIRESIDE SPRINT
(SSB)
JANUARY 12,
2000-2400Z
***

SPRING QSO PARTY
APRIL 11, (1200Z) TO
APRIL 12, (2400Z)
***

HOOT-OWL SPRINT (CW)
MAY 31,
2000-2400 (LOCAL TIME)
***

SUMMER HOMEBREW
SPRINT (CW)
JULY 12,
2000-2400Z
***

SUMMER DAZE
SPRINT (SSB)
AUGUST 9,
2000-2400Z
***

FALL QSO PARTY (CW)
OCT. 21, 1200 TO
OCT. 22, 2400Z
***

HOLIDAY SPIRITS
SPRINT (CW)
DECEMBER 6
2000-2400Z

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